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THE ROYAL SCOTTISH MUSEUM, EDINBURGH.

By Percy H. Grimshaw, F.R.S.E., Keeper of the Natural History Department, Royal Scottish Museum.

The Royal Scottish Museum was established in 1854 under the name of "The Industrial Museum of Scotland." The cost of a site was voted by Parliament, and while the present building was in course of erection several houses in the immediate neighbourhood were adapted and utilized as a temporary Museum, open to the public. The foundation stone was laid by the Prince Consort in 1861, and four years later the eastern half of the building was completed. This section was opened by His Royal Highness the Duke of Edinburgh on May 19, 1866, the name having been previously changed to "The Museum of Science and Art." The second portion was opened in 1876, and the west wing in 1888. In 1904 the name was changed once more, to the title it now bears. The institution is now directly under the control of the Scottish Education Department, and is maintained from public funds voted annually by Parliament. There are four separate Departments:—(1) Art and Ethnographical; (2) Natural History; (3) Technological; and (4) Geological. Each of the first three is under the charge of a Keeper, the fourth under an Assistant Keeper. There is also a well-equipped Library of some 30,000 volumes, under the care of an Assistant Keeper. The Museum is open daily, free of charge, from 10 a.m. to 5 p.m., on Saturdays to 9 p.m., and on Sunday afternoons from 2 to 5. The Library is accessible to the public on week-days.

The main entrance of the Museum is in Chambers Street (Fig. 1). Upon entering, the visitor finds himself at once in the Main Hall, of which we give two illustrations (Figs. 2 and 3). The ground floor of this Hall is devoted mainly to casts of Greek and Roman Sculpture, examples of Indian Architecture and Sculpture, reproductions of objects of Mediæval and Renaissance Art, specimens of Furniture and Woodwork, and collections of Coins. Along the front of the Main Hall runs a corridor containing, on the east of the main entrance, examples of metal work, and on the west, collections of medals and postage

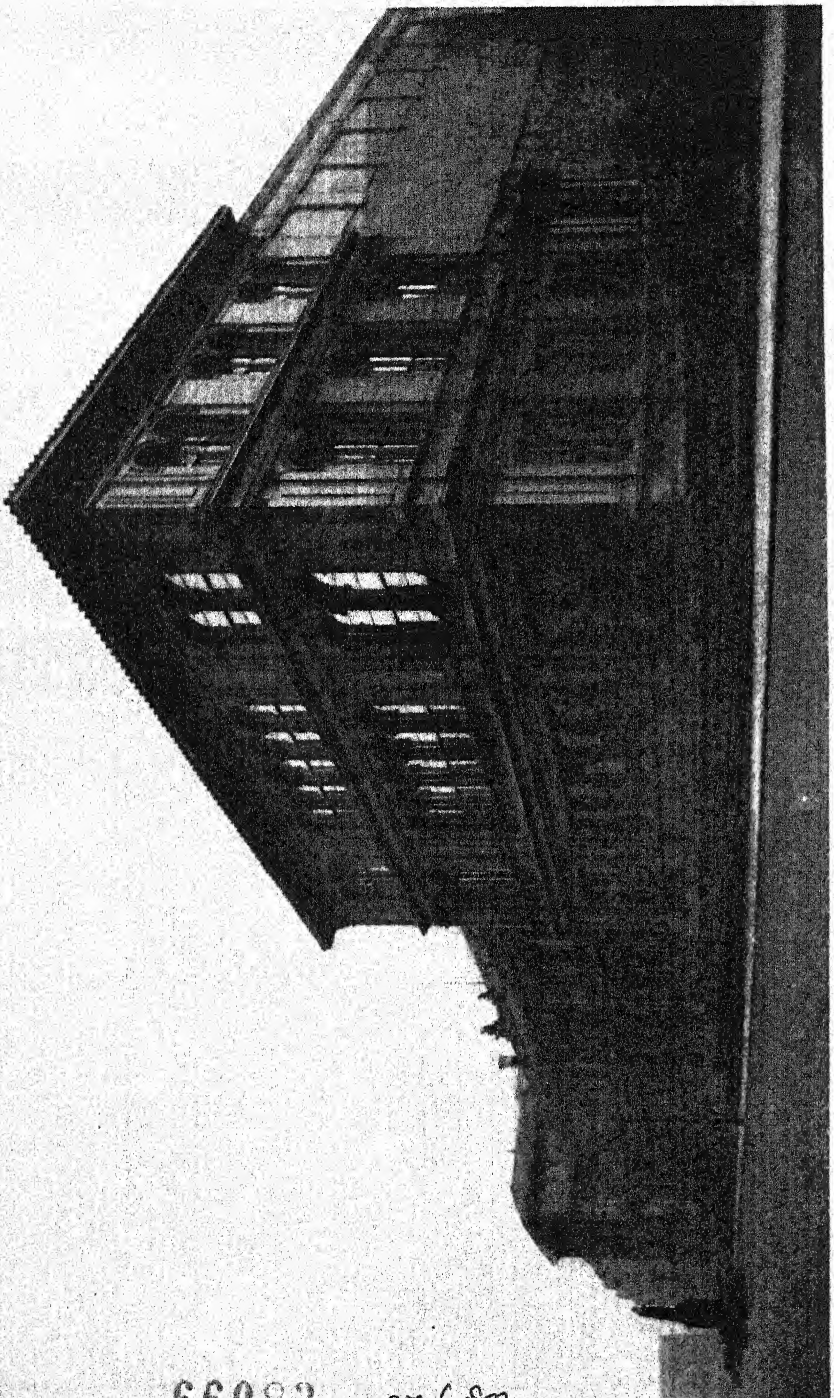


Fig. 1.—Royal Scottish Museum, Edinburgh. Chambers Street Frontage.

stamps. At the north-east corner of the building is a room containing Furniture of various periods, with a fine Flemish tapestry of early sixteenth-century date, portraying the Triumph of Prudence.

Running off at right angles to the Main Hall and opposite to the main entrance is a large Hall (Fig. 4) containing several large casts of European Architecture and Sculpture; a group of sculptured stones representative of Early Christian Art; and the main collection (including the "Sir Noel Paton" collection) of European Arms and Armour. In this Hall have been left, in their original and undisturbed positions, two portions of the old wall which was erected for the defence of the City of Edinburgh soon after the battle of Flodden.

To the east of the Hall just referred to runs a series of six large Halls devoted to Natural History. The first two of these are reserved entirely for British Animals, the one containing the Birds and the other the rest of the British Fauna. The Bird collection is a very fine one, containing nearly all the native species in various stages of plumage, and including several nesting groups in natural surroundings. An example of the Great Auk is exhibited, with its egg, as are also many other extremely rare species. The British Animal Hall adjoining contains representative series of Mammals, Fishes, Spiders, Insects, and Marine Invertebrates. Specimens of the Soay or St. Kilda Sheep, the "Wild" Goat of Scotland, the so-called Wild Cattle of Cadzow, and many rare Fishes may be seen in this Hall.

Passing eastwards we now enter the Antelope Hall, where will be noticed an exceptionally fine mounted example of a Baringo Giraffe, with a Nubian Giraffe in the same case. In the same Hall is also a splendid family group of the Alaskan Moose, set in natural surroundings, and including a male, female, and calf. The wall-cases contain a valuable series of Deer and Antelopes, also models of a typical set of Whales.

Passing through to the south the visitor now enters a Hall set apart for the display of remains and restorations of Extinct Vertebrates (Fig. 5). In the centre of this Hall is exhibited a cast of the skeleton of *Megatherium*, the Giant Sloth from South America. The actual skeleton of a gigantic, extinct, armoured mammal, the *Glyptodon*, may be seen in the rear. The wall-cases are at present undergoing revision, but when completed this Hall should appeal very strongly to the imagination of the visitor.

East of the Extinct Animal Hall is a room given up to

Beasts of Prey, and here one finds several pictorial groups, such as Walrus, Elephant Seal, Jackals, Wolverine, and Otter.

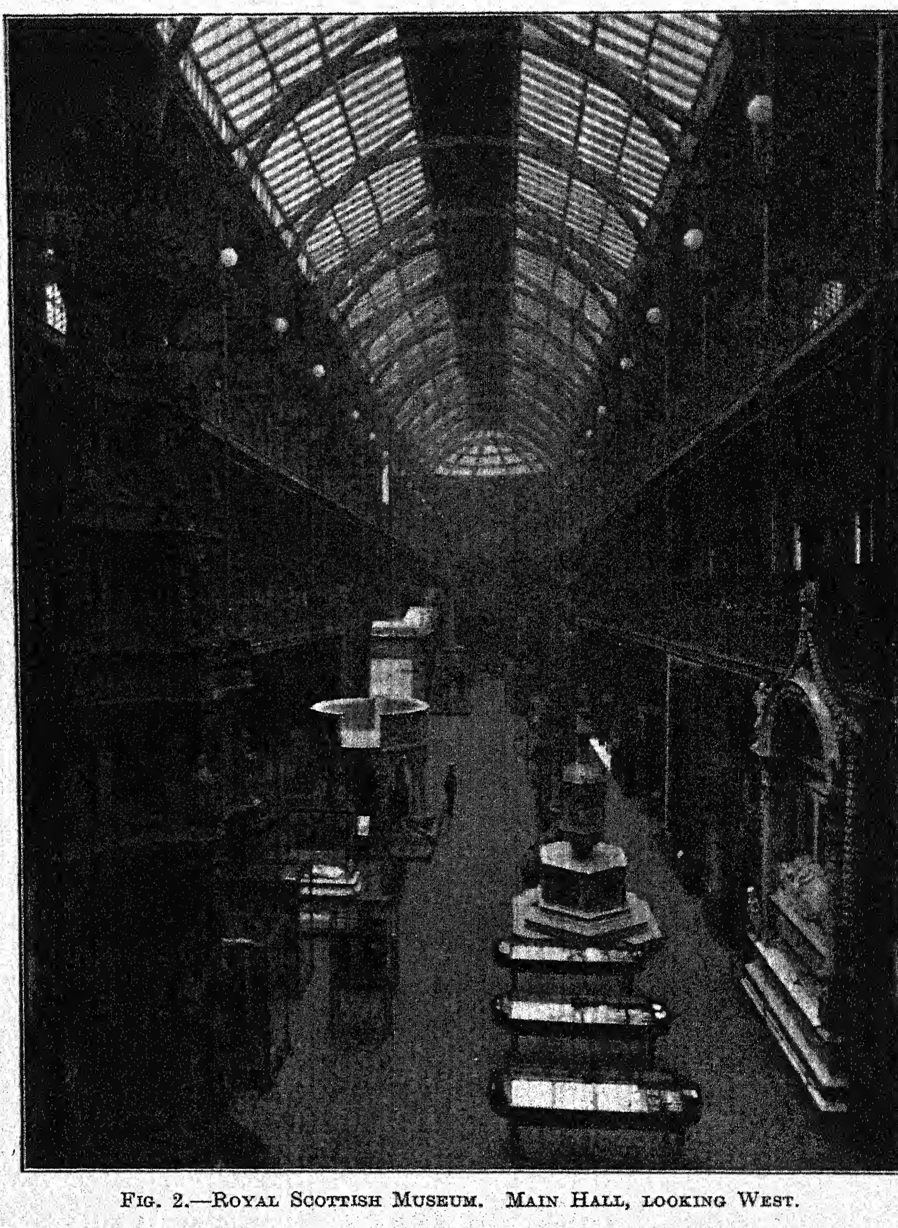


FIG. 2.—ROYAL SCOTTISH MUSEUM. MAIN HALL, LOOKING WEST.

Polar Bears and Lions are each exhibited in natural setting, while a series of Heads of Hoofed Animals, arranged according to continents, fills up the wall on the western side.

The Great Mammal Hall, shown in our illustration (Fig. 6), is now entered, and here the visitor will find the remainder of

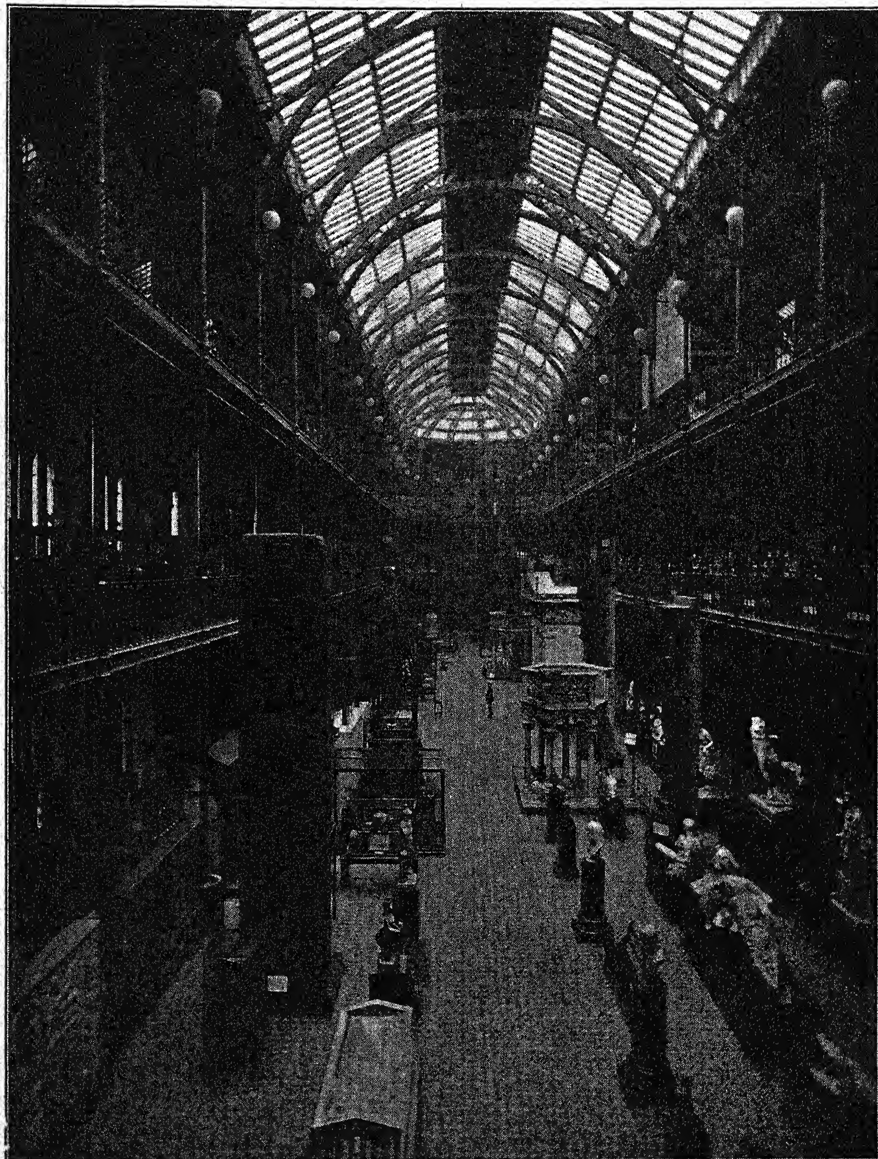


FIG. 3.—ROYAL SCOTTISH MUSEUM. MAIN HALL, LOOKING EAST.

the Mammals arranged systematically. Many rare species are exhibited, including a fine mounted example of the Quagga,

which has been extinct since the year 1880. A fine group of Zebras and an unusually large African Elephant cannot possibly be overlooked, while overhead is suspended (as seen in the photograph) a skeleton, 78 feet in length, of a Sibbald's Rorqual or Blue Whale, stranded at North Berwick in 1831 and dissected by the famous anatomist, Dr. Robert Knox.

It will now be advisable to ascend one of the stairs at the east end of the Main Hall, and upon reaching the first floor a change of subject may be had by entering the large hall in the

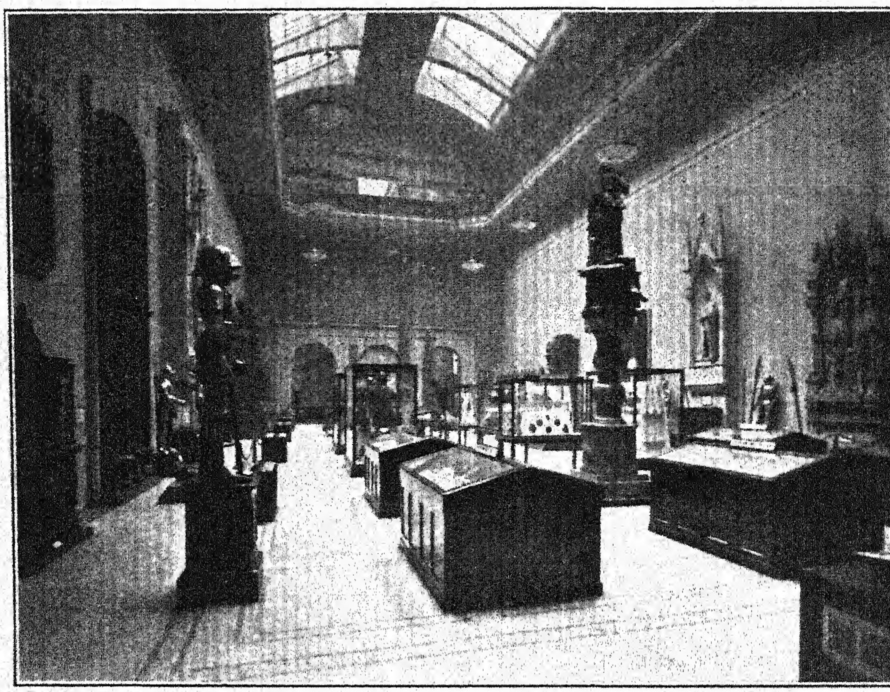


Fig. 4.—Royal Scottish Museum. Hall of European Arms.

north-eastern corner, which contains the important Egyptian collections, arranged to illustrate the manners and customs, the religion, and the arts and crafts of the Egyptians from the earliest times to the Coptic period. In the centre of the hall is a fine collection of alabaster, stone, and earthenware vessels, dating from the early prehistoric age to the 30th dynasty (fourth century B.C.). A collection of Babylonian and Assyrian antiquities and a series of cuneiform tablets of clay from Mesopotamia are also on view in this room.

Leaving the Egyptian Hall towards the south a large gallery

is next entered, which contains the exhibited collection of Foreign Birds. Here many rarities will be seen, and several examples of extinct Birds, such as the Dodo, represented by bones and a restoration, the Hackled Pigeon of Mauritius, the Solitaire, represented by a skeleton, and so on. The specimens in this gallery are arranged systematically, but in many cases nests are shown with natural surroundings. At the south end of the gallery a door leads into a room reserved for students, who will find there most of the cabinet collections of Birds and

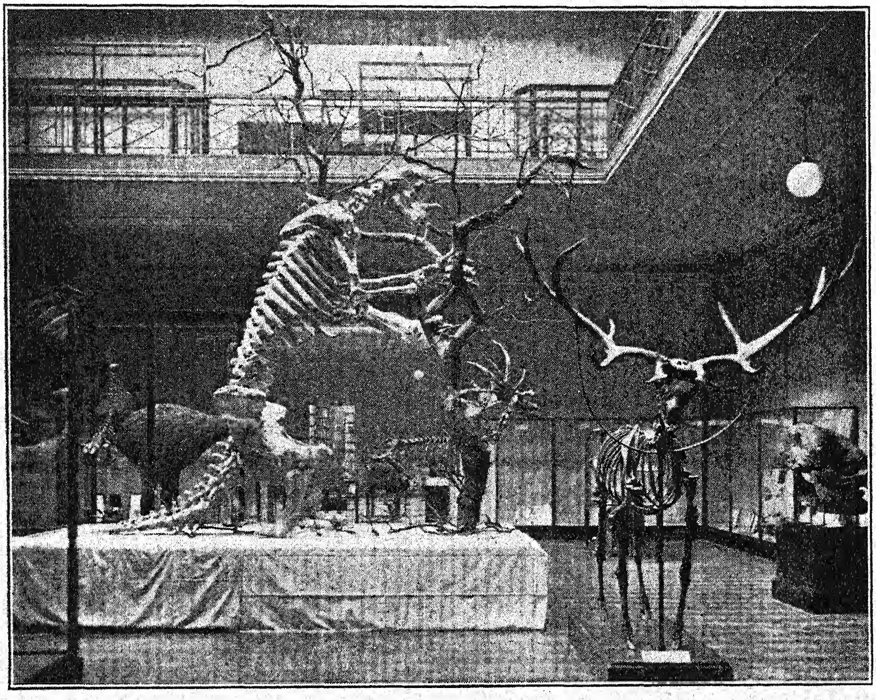


FIG. 5.—ROYAL SCOTTISH MUSEUM. EXTINCT ANIMAL HALL.

Insects, with the exception of such as are, for reasons of space, stored beneath the exhibition-cases in the various galleries.

From the Foreign Bird gallery an opening on the western side leads into a gallery, in which are exhibited most of the Lower Invertebrates, including Protozoa, Sponges, Corals, Echinoderms, Crustacea, and Insects. Adjoining this room is another containing the rest of the Invertebrates, most of the space being occupied by a fine series of Mollusca. The galleries to the south of the two last-mentioned rooms are still in course of preparation, but half of that on the eastern side is already

open to the public and contains a series of exhibits illustrating the origin and evolution of Man, and other series, of an elementary character, teaching the broad principles of development and Mendelian inheritance (Fig. 7). The gallery on the western side is being arranged as a Children's room, and is in active preparation. It is hoped that this room, when completed, will be one of the most instructive, for young and old alike, in the Natural History Department.

It is now necessary for the visitor to retrace his steps in order to reach the first-floor gallery of the Main Hall. Here are displayed, on the south side, valuable collections of glass and pottery of all ages and nations. The northern half of this gallery contains silverwork, enamels, ivories, and small specimens of carved woodwork. Running parallel with this part of the gallery is a long corridor, lighted from the street, in which is a fine series of exhibits of Egyptian, Chinese, Japanese, Indian, and Persian Art. This corridor leads, at its western end, into a large hall devoted to Ethnography. Australia, Indonesia, and the Andaman and Nicobar Islands are represented on the western and northern sides, but most of the hall is devoted to the extensive African collection.

The large gallery to the south is given up to the native Art of North and South America and Oceania. After inspecting these fine collections, the visitor proceeds in an easterly direction to enter a smaller gallery containing the Textile collections, and then may climb the stair of the Main Hall to the second floor. In the north-west corner of the building at this level is a large hall containing a very fine collection of Scottish Minerals, and also a Type Collection of Rocks and Rock-forming Minerals, arranged for the benefit of students. In this hall are also displayed several interesting and instructive geological models, illustrating the scenery of various parts of Scotland and elsewhere. The gallery to the south of this hall is occupied by the important collections of Fossils, Rocks, and Maps brought together by the officers of His Majesty's Geological Survey.

Passing eastwards, a gallery devoted to general science for the use of students is entered. Here will be found models of chemical plant, chemical, physical, and meteorological apparatus, and also a series of botanical exhibits. Passing still further eastwards, one enters the large gallery of Comparative Ethnography, where the specimens are arranged according to the nature of their use, and from which one may gain a fine view of the ground floor and its exhibits, since in this section of the building there is no first-floor gallery.

The east wing of the building at this level is largely occupied by the Natural History Department. Commencing with a

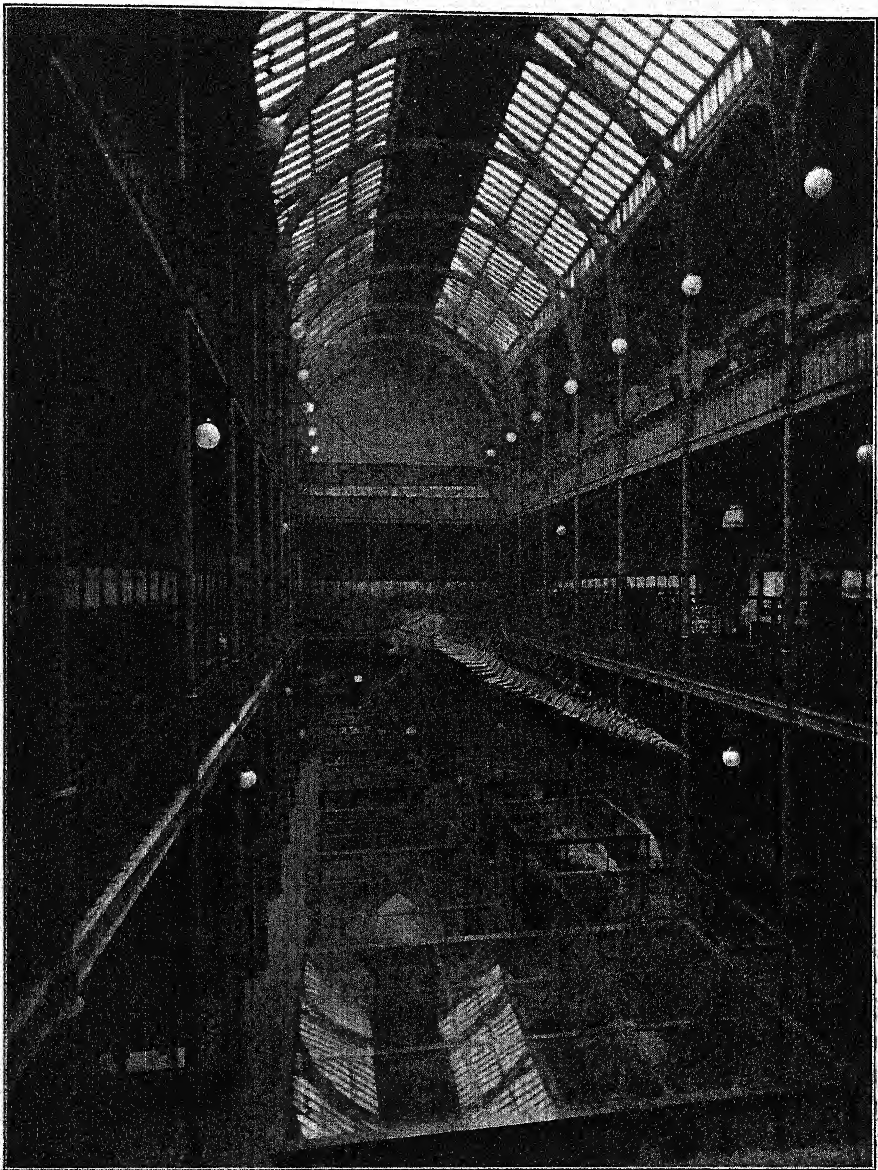


FIG. 6.—ROYAL SCOTTISH MUSEUM. GREAT MAMMAL HALL.

gallery entered from the Ethnographical gallery just mentioned is a room arranged specially to satisfy the needs of students

of the general subject of Zoology. Examples and preparations from each group of the animal kingdom are displayed with detailed labels, commencing with the Protozoa and leading on through the various classes up to Man. The desk-cases adjoining the railing contain preparations, illustrating animal topography and descriptive zoological terms. This gallery is of much service to first-year students and to those who are intending to enter the dental profession.

The hall to the south of that last described is devoted to exhibits of interest to Civil Engineers, and contains examples of the Optical Apparatus used in Lighthouses, and models of the various Lighthouses which have been built on the Eddystone Rock and the Bell Rock, etc. Waterworks Engineering is also illustrated by models, and the subject of Bridges is fully dealt with.

Proceeding eastwards two galleries are entered containing the Gubbin and the Robert Dunlop collections of Fossils and a fine representative collection of Minerals of the World, arranged according to the system of Dana.

The extreme east of the building on this floor is occupied by three large rooms belonging to the Natural History Department. The first of these is not yet open to the public, but will eventually contain an extensive Osteological collection, arranged to show the evolution and adaptation of the skeleton of Vertebrates and a series of skeletons of all the higher Scottish animals. The large gallery, which may be entered from the gallery of the Main Hall, contains the exhibited collections of Fishes, Recent and Fossil, while the large room in the north-east corner is entirely devoted to Reptiles. This room has recently been rearranged, and is now much more attractive than formerly.

The visitor may now walk round the gallery of the Main Hall, where he will find a collection of Arms and Armour, Oriental Textiles, and, on the north side, an extensive series illustrating the Arts of Asia. The tour of the second floor of the Museum has now been completed, and a descent should now be made of the stair to the ground floor, where a few rooms at the west end remain to be visited. The largest of these rooms is one containing an instructive series of working models of machines and engines of various kinds. There are also several fine models of Warships and other vessels, Aeroplane exhibits, and so on. Next to this hall on the east is a smaller hall devoted to the subjects of Mining and Metallurgy, and here again will be seen some very instructive models.

The principal collections on exhibition have now been seen, but it must not be forgotten that there is a great wealth of material stored in cabinets, access to which can be obtained by those specially interested, upon application to the staff. In the Natural History Department there are many important collections housed in the various cabinets which are placed either in the Study Room or beneath the desk-cases which are

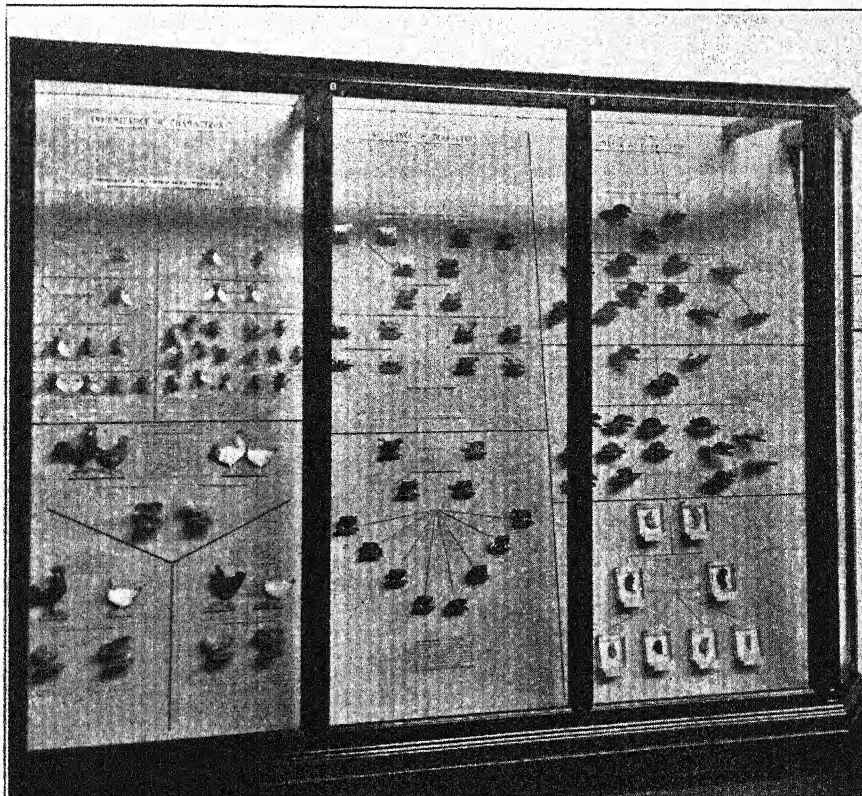


FIG. 7.—ROYAL SCOTTISH MUSEUM. EVOLUTION GALLERY: EXHIBIT ILLUSTRATING PRINCIPLES OF MENDELIAN INHERITANCE.

built round the different galleries. The "Dufresne" collection, containing many thousands of specimens of Birds and Insects, was acquired by the University in 1819, and in 1865 transferred to the Museum. In this collection are to be found many type-specimens of Insects, described by Godart and Olivier. An important collection of Birds' skins from the great Tweeddale collection and many other more recent acquisitions of great value are carefully housed in this Museum. The collection

formed by Hugh Miller, when writing his classical works on the Old Red Sandstone, are on exhibition at the south end of the Fish gallery, and in the same room are to be found, either exhibited or in cabinets, the great collections of Scottish Fossil Fishes, described by Agassiz, Traquair, and, quite recently, Stensio. The cabinet collections of British Birds and of British Insects are also of great importance, containing as they do many rare species and unique specimens, the enumeration of which is impossible in this place. With regard to the exhibition of specimens, modern ideas are in this Museum gradually replacing the older methods of arrangement, which have always tended to tire the visitor. Endeavours are now being made in each Department to make the exhibits tell a story, by the more efficient grouping of the specimens, and by the preparation of informative labels.

Before this account is closed attention should be drawn to the very handsome staircase, which has been recently erected on the south side of the Museum, temporarily for use in case of emergency, but eventually to form a conspicuous feature in the centre of this great Museum when the plans for extension are finally carried out.

A NEW IRISH WOLFHOUND.

By J. Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

A champion Irish Wolfhound, "Lady of Raikeshill," has recently been presented to the Museum by Mrs. William Knox, whose kennels at Raikeshill, Yorkshire, are famous as a centre for this breed.

The new specimen is a fine adult female, which was born in December 1926 and died suddenly in November 1931. It may thus be regarded as having died in the prime of life and is, on this account alone, a very valuable addition to the Collection of Domesticated Animals. In life, she was generally considered to be a most beautiful hound; she had a handsome head and the gentle brown eye of the deerhound, and was tall, measuring about 35 inches at the shoulder, with a long, splendidly shaped back, very deep chest, and well-arched loins.

The Irish Wolfhound, or Wolfdog, as a breed has nearly died out on more than one occasion; at the present time, thanks to the energies of Mrs. Knox and other breeders, it would appear to be in a fairly flourishing condition, and there seems

to be little fear of the breed becoming extinct in the near future.

These dogs are of considerable antiquity, since it seems highly probable that the Belgic dogs, used by the Romans in the combats in the arena, were either identical with the Wolfdogs or were their immediate ancestors. The Belgæ

IRISH WOLFHOUND "LADY OF RAIKESHILL."

undoubtedly imported into Ireland the first specimens of these large dogs. Sir James Warr refers to the Irish Wolfdog in his "Antiquities of Ireland," and quotes from an epistle by Symmachus to his brother Flavonius, in which reference is made to some 'Canes Scotici' having been shown at the Circensian Games, "to the great astonishment of the people, who could not judge it possible to bring them to Rome otherwise than in iron cages." In the time of Symmachus, that is towards the

latter end of the fourth century, Ireland was known by the name 'Scotia,' and it seems more probable that the dogs referred to in this letter were Irish Wolfdogs rather than British Mastiffs. The latter, as Warr points out, would not have caused "great astonishment" when exhibited at the circus, as the breed was well known.

The Wolfdogs of Ireland were probably introduced into Scotland at a very early date and were there used more for hunting deer than as wolfdogs, and thus became known as

Mrs. Knox with a Group of Wolfhounds.

'Deerhounds.' It seems almost certain that the Highland Deerhound and the Irish Wolfhound were originally one and the same breed. Both dogs appear to have diminished in stature since these early days, the Scottish breed more so than the Irish one. As the number of wolves decreased in Ireland so the wolfdogs got less popular and, had it not been for a few enthusiasts, the breed would have disappeared about the same time as the wolf became extinct, that is about the year 1766.

When the breed was in very low water in the early part of the nineteenth century, the Irish Wolfhound Club was formed and did much good work to help in perpetuating it.

One of the Club's activities was the publication of a small book entitled "The Irish Wolfhound," by Captain G. A. Graham, which was published in 1885, and helped to stimulate breeders in Great Britain and Ireland.

This new specimen has been very finely set up in the Rowland Ward studios and is now on exhibition in the North Hall. In addition to the photograph of "Lady of Raikeshill's" head, taken from the living animal, there is also reproduced as an illustration to this article a group of Mrs. Knox's Irish Wolfhounds, including "Lady of Raikeshill," at exercise with their owner.

BEHIND THE SCENES IN THE MUSEUM. I.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

There are few public institutions whose aims and functions are so vaguely understood by the general public as are those of museums; and the reason for this must lie mainly with the museums themselves, for, since the first museum was founded nearly twenty-three hundred years ago, all manner of buildings, containing all kinds of objects, have performed various functions, or often no function at all, under the name of museum.

The word museum originally meant temple of the Muses, and later came to be applied to a place devoted to the works of the Muses. The first museum of which we have any record was that founded by Ptolemy Soter in Alexandria towards the close of the fourth century B.C. This institution, indeed, lived up to its title, for it was adjacent to and connected with the Temple of the Muses, and it maintained, at the expense of the State, a band of students whose undivided task was the advance of knowledge.

Throughout the Dark Ages there is no record of museums, but in the Middle Ages, with the revival of learning, the name came to mean the collections of miscellaneous objects—whether antiquities or specimens of natural history, paintings or sculpture—often found in the studies of scholars or in the halls of the wealthy.

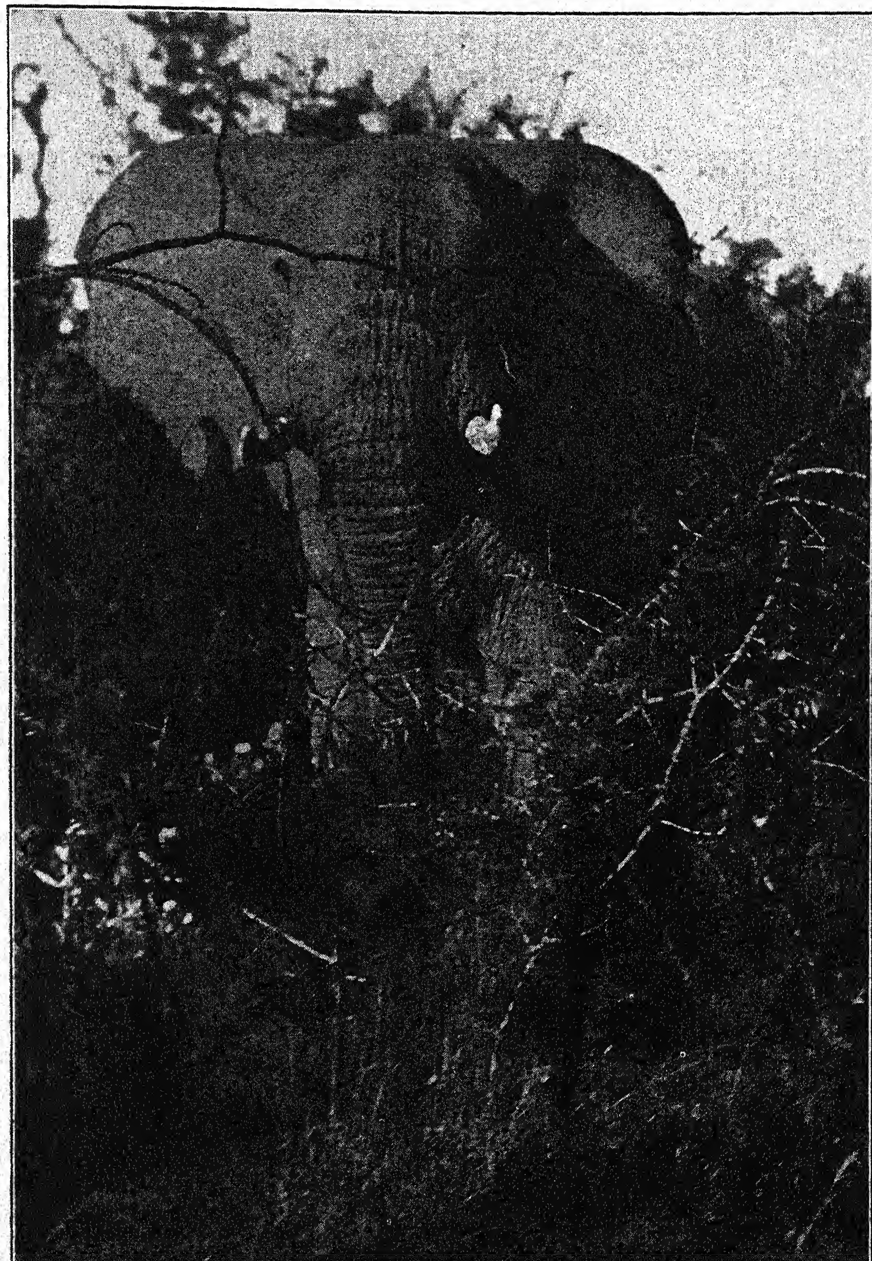
In these early forms of museum there was, however, no suggestion of public exhibition, and the idea of collections for the instruction or amusement of the general public is less than two hundred years old. In fact, it is only within the last sixty years that museums in our sense of the term have become at all

common. Unfortunately, no common aim dictated the policy of these numerous and varied institutions, and much of what unpopularity is attached to the museum idea descends from the less successful of these collections. Even to-day some exist, and to many people the word museum unhappily conjures up the vision of a dusty and often dilapidated building, whose musty rooms contain serried ranks of stuffed birds with unreadable labels, piles of "stones" labelled "Geological Specimens," and other curious objects, whose only claim for inclusion in a museum would appear to be their complete unsuitability for anywhere else.

Fortunately, the position has greatly improved, and even in the small provincial towns excellent museums now exist; but the old prejudices linger, and the purpose of the magnificent collections in the national institutions is not always clear to the visitor. Of course, there are many kinds of visitors, ranging from the man who seeks the comfortable and free shelter of the warm building to forecast the winner of the two-thirty to the distinguished scientist who comes to study some abstruse problem: and there are several lines of policy. "The first function of a Museum," wrote Ruskin, "is to give example of perfect order and perfect elegance, in the true sense of that test word, to the disorderly and rude populace," and, no doubt, many are attracted by splendid buildings and pleasing interiors, which are what Ruskin really specified. Many more come to museums to see curiosities; to such a two-headed sheep or an immense skeleton is an irresistible attraction. Forty-two years ago it was said of the British public by a prominent museum official, that "it is almost impossible, by any means short of fireworks, to attract their attention to fossils less than a yard in diameter." The same statement is almost as applicable to-day.

The function of the Natural History Museum has been defined as twofold: (1) the *diffusion* of scientific knowledge, and (2) the *advancement* of the same. In accordance with this view, the collections are of two kinds: firstly, an exhibited portion which all may see; and secondly, a reserve series, kept in drawers and private rooms, for consultation by accredited students.

The general public therefore is familiar only with the large series of exhibited specimens. As one's knowledge is, so one's reaction to this series will be. Some visitors wander round the galleries, vaguely passing the time and viewing the collections with an ununderstanding wonderment equal to that felt on looking through a mediaeval manuscript: to others the collections have glimpses of intelligibility, but mainly seem to be



Photograph by courtesy of Marius Maxwell.

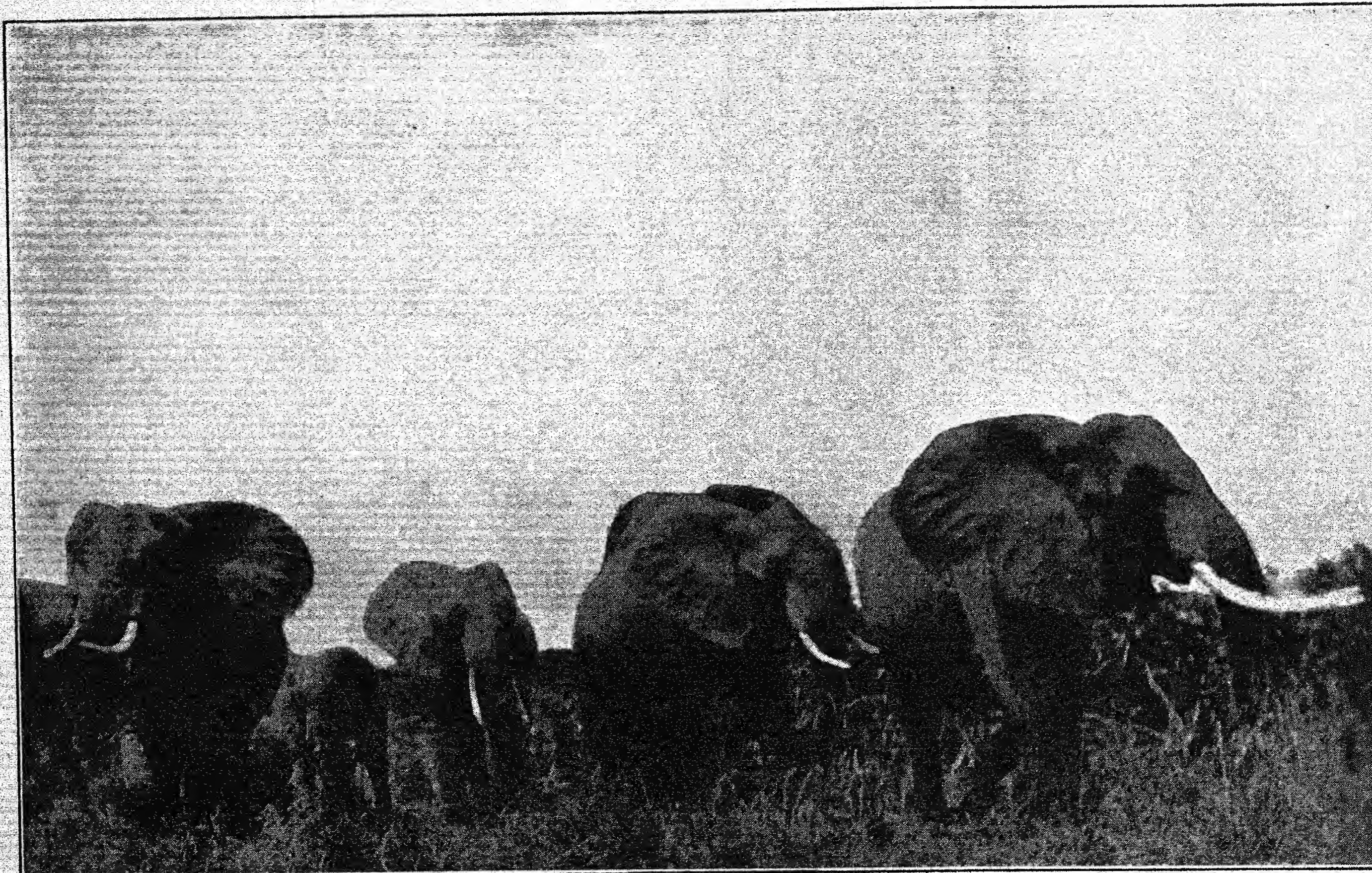
STUDY OF EAST AFRICAN ELEPHANT IN ATTITUDE OF ALARM AND SUSPICION.

The head is elevated, the tusks thrust forward, and the ears widely spread. Immediately before an animal charges the trunk is frequently thrown aloft and is then curled tightly up during the actual charge.

Photograph by courtesy of Marius Maxwell.

A FAMILY PARTY OF EAST AFRICAN ELEPHANTS.

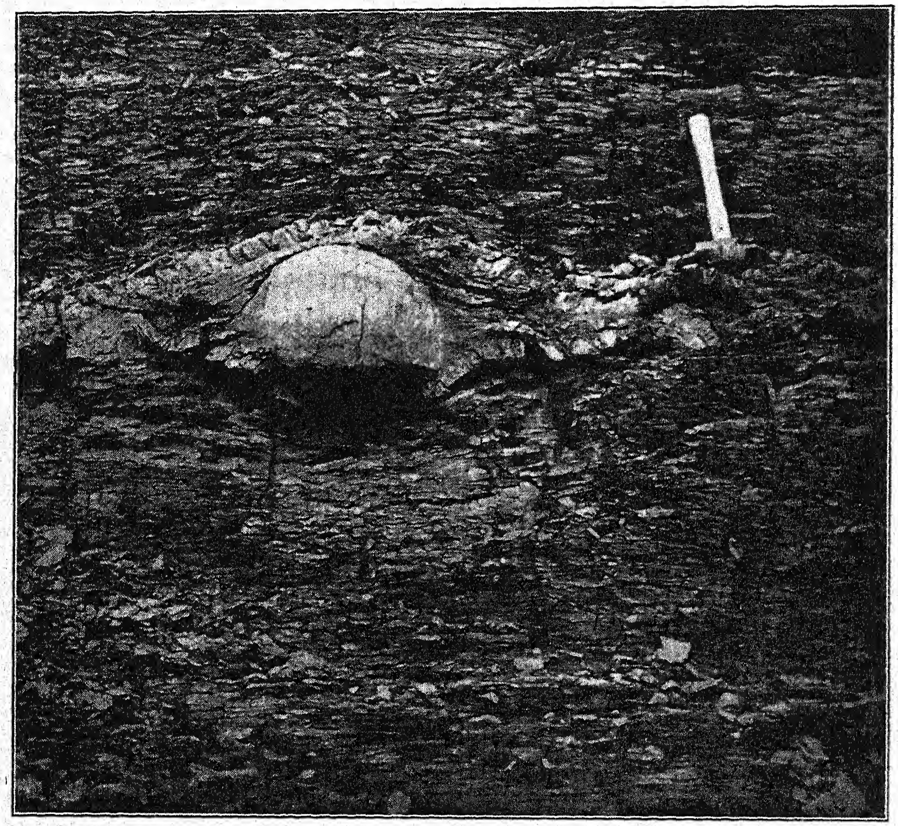
Cow elephants are sometimes found accompanied by two or three calves of different ages. In the case of two calves there is usually a difference of from three to five years in their ages. When three young ones are present the oldest of them would be a sub-adult specimen. In Africa, a female elephant probably begins to breed when twenty years old; a bull elephant is considered to be at its prime at the age of fifty.



Photograph by courtesy of Marius Maxwell

A Charge of African Elephants in the Lorian Swamp, Northern Frontier Province of Kenya Colony.

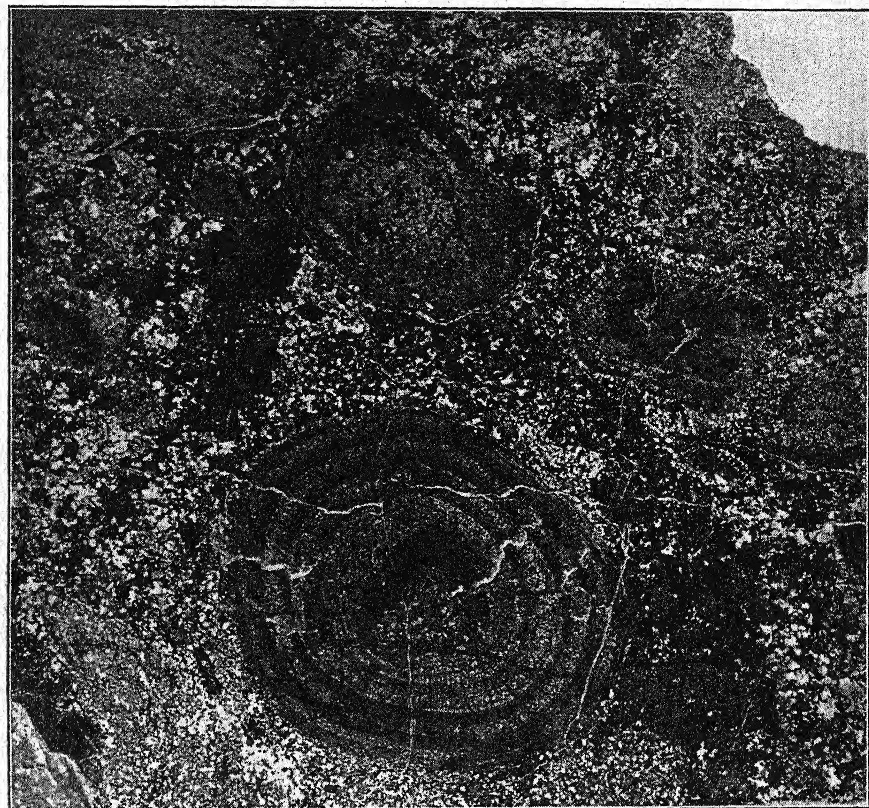
The elephants advanced in a V-shaped formation, with the bulls on the flanks and a vicious cow with calf in the centre. The cow elephant left its calf and came up at a rapid amble into line with the leading bulls, its head thrust forward and its tusks levelled at its opponents. At such a time it became necessary to fire, and to fire to kill, as the range was too short for anything else. The female elephant was accordingly shot and, taking advantage of the consternation caused by the report of the rifle, in order to avoid further destruction, the photographer and his friend then sought cover. From here they observed the bewildered animals form a cluster around the body of their fallen comrade and leader, where they remained for a brief period before making off in a slow and sedate fashion into



Photograph by T. W. Reeder.

LIMESTONE NODULE IN BEDDED MARL.
Charmouth, Dorset.

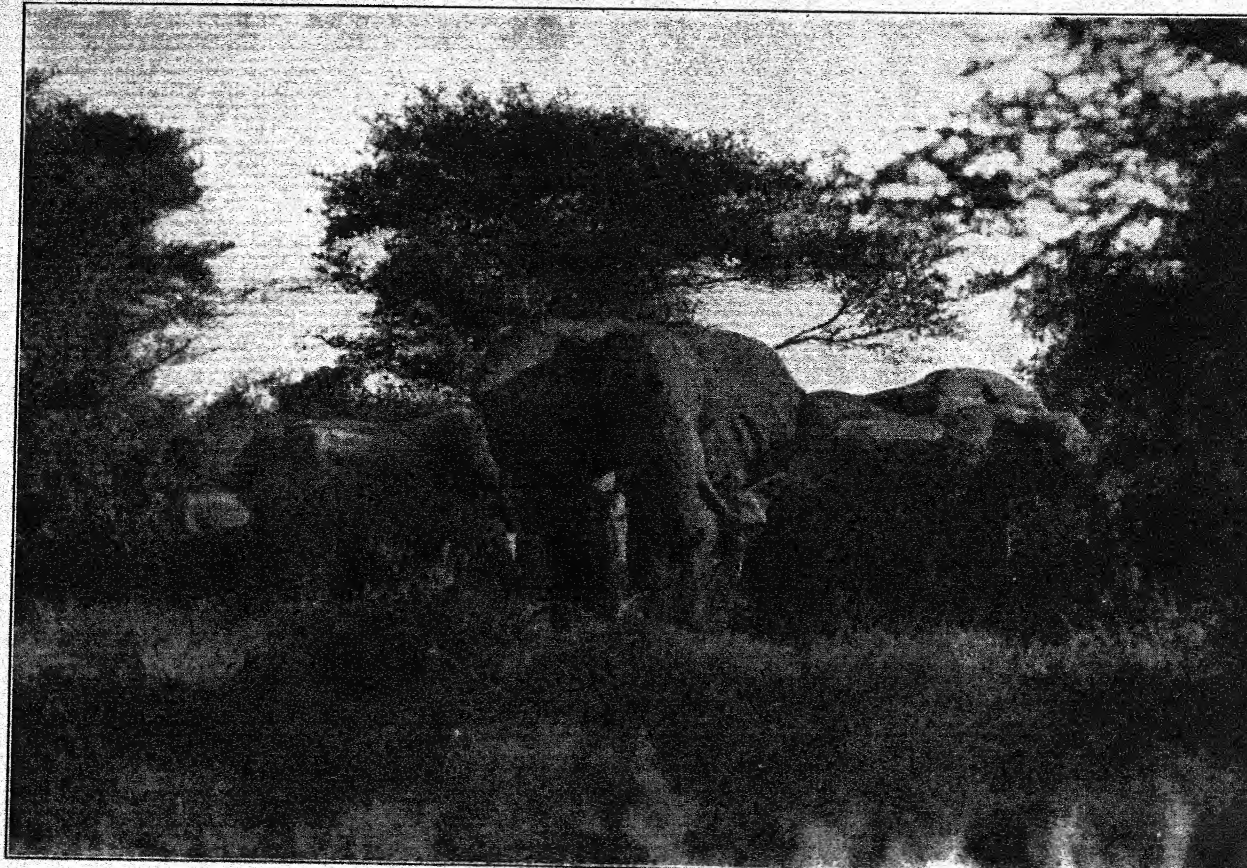
The spherical nodule is formed of hard limestone, in which bedding planes are apparent. This shows that limy matter from the surrounding marl segregated at this spot and impregnated the marl. As the nodule grew, the surrounding bedded marl was pushed apart, and the bedding planes are seen to bend round so as to enwrap the nodule. Moreover, the nodule is seen to lie in a string of "beef," that is, fibrous calcium carbonate showing "cone-in-cone" structure. Beef also is a secondary deposit, which has segregated along the bedding. A beef-seam is generally double, each half parted by a film of crumbly marl. The nodule in the photograph is seen to lie in the main parting of a thick beef-seam, the beef forming a jacket enwrapping the nodule. The coarse cone-in-cone structure of the beef is well shown above the nodule on the left, and below it on the right. The geological age is Lower Lias.



Photograph by H. G. Herring.

ORBICULAR DIORITE.
Roselle Point, Alderney.

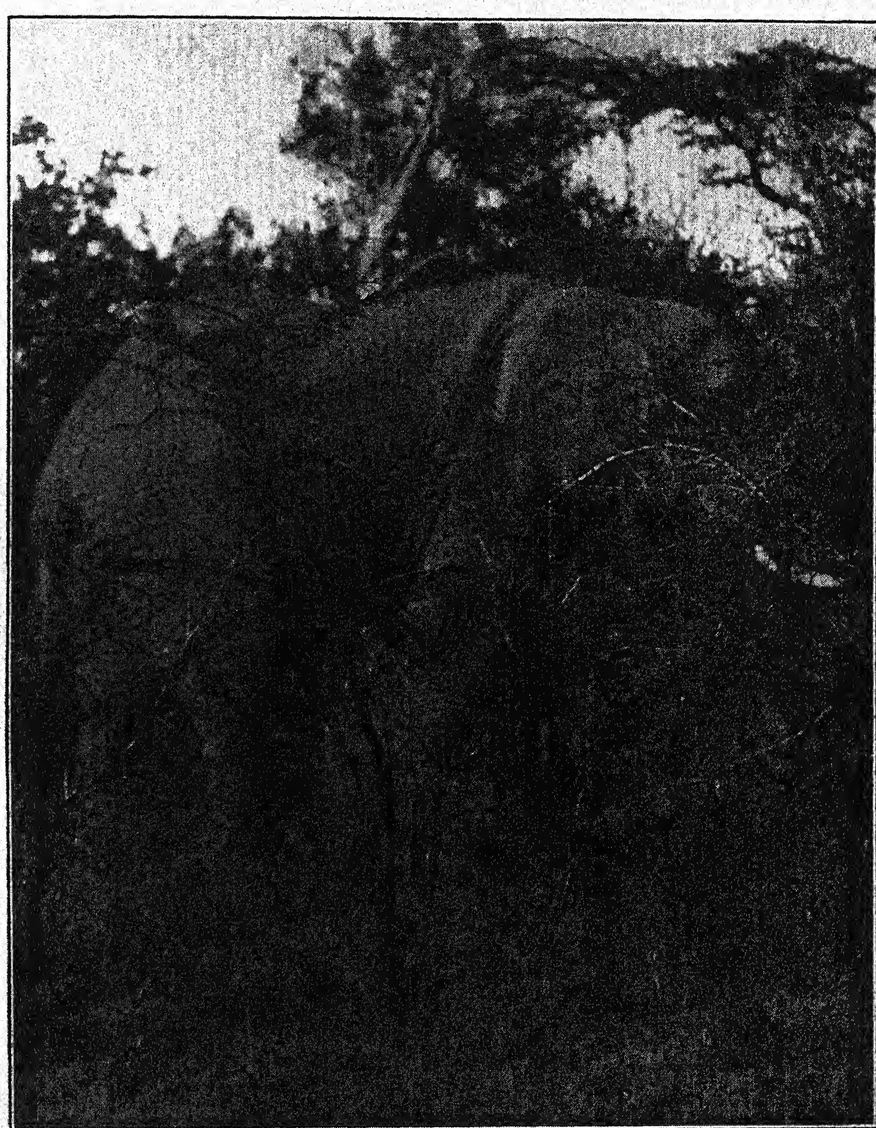
Part of a polished specimen recently collected for the Museum by Dr. A. E. Mourant from Roselle Point on the north coast of Alderney. These remarkable spherical bodies in the diorite are something like the surrounding rock in composition, but the light and dark minerals (felspar and hornblende) tend to separate into alternate light and dark layers. This structure is the result of reaction between the originally molten rock and inclusions of an older more basic rock (gabbro). Relics of these inclusions survive in some of the spherules as nuclei. The largest orbicule in this picture measures five inches along its greatest diameter.



Photograph by courtesy of Marius Maxwell.

MASTER BULL OF A HERD OF ELEPHANTS, WHICH HAS ASSUMED A CHALLENGING ATTITUDE.

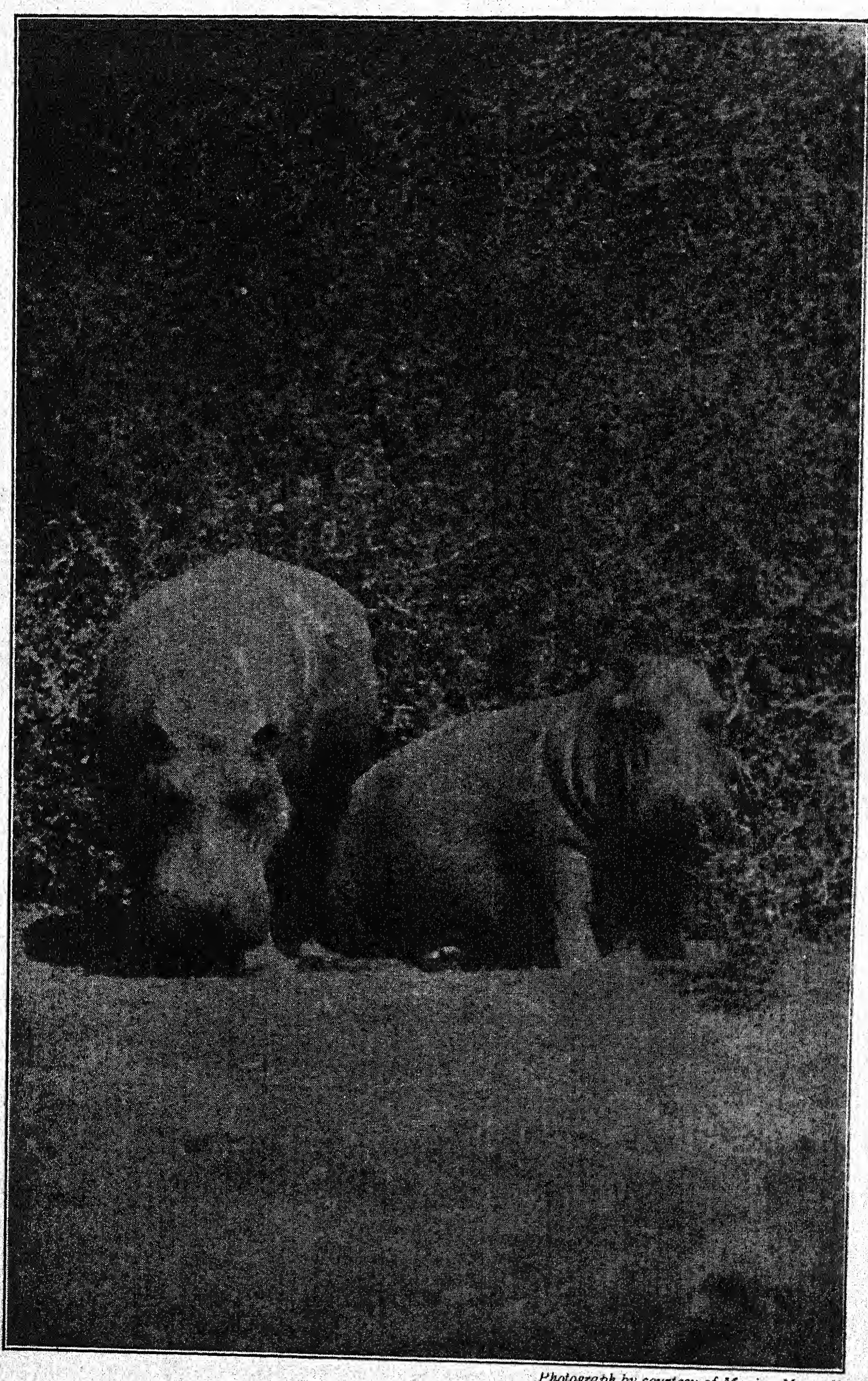
Other elephants of the herd became alarmed and in a few minutes a general state of panic and confusion ensued. Elephants burst out from all sides of the bush to join their companions in the open and gave the photographer a very uneasy few minutes. However, after a noisy demonstration, the leaders of the herd turned about and led the entire party back into the bush, and the photographer also beat a retreat—but in the opposite direction.



Photograph by courtesy of Marius Maxwell.

An Elephant almost hidden by the Bush, the White Tusks alone betraying its Position.

The animal is standing motionless and alert, listening for the slightest sound. It has got wind of its pursuer and become suspicious of danger.



Photograph by courtesy of Marius Maxwell.

A Group of Hippopotami encountered in the Region of the Northern Guaso Nyiro.

They were unable to reach the river owing to a thick hedge of thorn bush behind them. They began trotting restlessly up and down in front of the camera. Then, taking things

unrelated to every-day life. To some, again, the Zoological Department is "the stuffed Zoo"; to others the Geological Department contains improbable relics of a time now, happily, past, but kept in green memory by a number of individuals who would otherwise be unemployed.

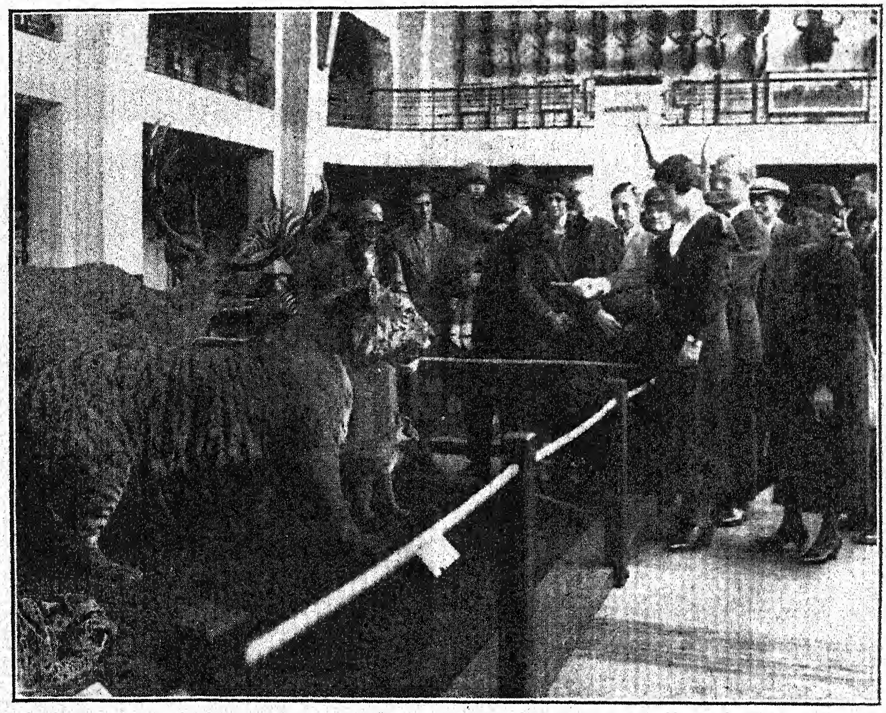
Fortunately, to most visitors the exhibited specimens are veritable illustrations from the book of life, and a welcome relief from the drab features of every-day existence. Even such intelligent and appreciative visitors do not always understand the Museum's function. To a member of the Staff the query is not uncommon: "But what do you do? The cases are full of specimens and the galleries are full of cases. What is there left to do?" Beyond the necessity of keeping the building clean and guarding its contents little seems to be called for.

Yet all the gallery space is the least of the Museum's work. The galleries are the Museum's shop windows, and, although few persons would think of shop windows as the whole shop, it is commonly assumed that exhibition galleries are all of a museum. Behind the scenes in the Natural History Museum is as busy an organization as in any departmental store. Many branches of science and art, including engineering and medicine, wait upon the researches carried out there. A mistake in identification in a zoological laboratory here may mean lives lost in Africa or ruin to a furniture dealer. This work, too, is all in addition to that necessary to keep the exhibition galleries in order. Days of work lie between the catching of a butterfly in a meadow and the specimen's appearance in the gallery, and months, even years, of work may elapse in the preparation of a single fossil mammal or reptile. What, then, is the work of the Museum Staff, and to what useful end does it contribute?

From the public point of view the Natural History Museum is an unusually large building, with a great amount of its space devoted to the exhibition of natural objects. The actual floor space so used, at the moment, is approximately 200,000 square feet, or almost exactly 4½ acres. The number of specimens before the public in this space cannot well be computed, but amounts to several millions, while their value is also inestimable, as many of the specimens are irreplaceable and priceless. The average number of visitors who view these collections in a year is 550,000, and of that number nearly 100,000 come to the Museum on Sunday afternoons.

It requires little imagination therefore to realize that the maintenance and warding of the exhibition galleries is a task of

some magnitude. A staff of thirty-eight is required for warding the premises, inside and out, and one of twenty-nine for cleaning the galleries and cases, but the latter staff has, of course, additional duties to perform. It may be of interest to mention that, contrary to the general practice, the cleaning of the galleries is done in the morning, so that the public are admitted into freshly aired and cleaned galleries. For the safety of the public a first-aid station is maintained, while several members



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THE OFFICIAL GUIDE LECTURER CONDUCTING A PUBLIC TOUR IN THE EXHIBITION OF GAME ANIMALS OF THE EMPIRE.

of the staff are qualified doctors. The danger of fire is naturally keenly appreciated; naked lights and smoking are strictly prohibited in the Museum, and an adequate staff of firemen is always on duty.

The actual description of the galleries and the specimens cannot be given here, but each exhibit is labelled so as to make it intelligible to the public. It should also be stressed that all the specimens in the Museum are not in the galleries, and that those specimens which are on view are intended to convey

information, and not merely to fill up available space; space is all too limited. Visitors or students who desire to understand more of the Museum's contents can obtain information of a general or detailed character from the numerous guides and catalogues published by the Trustees. These books enjoy a wide popularity and many of them are used by students in universities and colleges throughout this and other countries. These publications, together with a very large and varied series of post-cards, both plain and coloured, can be purchased at the Museum bookstall in the Central Hall. A complete list of these can be obtained, post free, on application to the Director.

A less laborious method of obtaining information about the collections is supplied by the Guide Lecturer, who takes two tours, one in the morning and one in the afternoon, each lasting for an hour, every day of the year except Sundays, Christmas Day and Good Friday. These tours are free and are attended by approximately 14,000 persons every year. All the galleries are dealt with in the course of a week, and an excellent opportunity is thus afforded every visitor of obtaining first-hand information about the exhibits. Private parties can be given special tours by arrangement, and the tours mentioned do not include the great amount of work which the Guide Lecturer does for schools and children's societies. Essentially the Guide Lecturer is the liaison officer between the public and the Scientific Staff. A course of more specialized lectures, given by members of the staff on Monday mornings, has recently been inaugurated, and has proved to be popular.

Many additional services are rendered to the general public by the Museum office and libraries, but these activities will be dealt with later.

The establishment of the British Museum marked the revival of the Ptolemaic conception of museums. Here again, at the expense of the State, research workers are maintained to advance knowledge; but the British Museum goes further, for the public are also directly catered for. This public service, second to none in the museum world, is obtainable on every day of the year except two. It is a willing service, never complaining of overwork, but always searching to extend itself and for fresh fields of endeavour. The Museum is literally the gateway of knowledge and its motto might well be: "Knock, and it shall be opened unto you."

A NATURALIST'S VISIT TO THE PARC NATIONAL ALBERT, BELGIAN CONGO.

By The Hon. M. Hachisuka.

On the bed of the Great Rift Valley, where Uganda meets the Belgian Congo, exist numerous large and small lakes, together with semi-arid plains and high mountains. This region is not well known, but those who have occasion to pass through it are delighted with the pleasing diversity of scenery that encounters the eye. Because of this diversity the region is often known as African-Swiss.

In 1929, under the auspices of King Albert of Belgium, the Government established the large nature reserve known as the Parc National Albert.* Since then several expeditions have been sent there to improve the organization of the Park with a view to making the region of easier access to travellers, and, at the same time, to collect scientific material. The last expedition was organized early in 1931, under the leadership of Dr. J. M. Derscheid, the Administrator of the Park. I accompanied the expedition as a naturalist, and our party, consisting of seven members, travelled in two motor-cars, arriving at the Park in February.

After our landing at Mombasa, the journey through Kenya and Uganda was a comparatively easy one. We travelled in moderate comfort, though some roads were a heavy trial to our safari cars; while we often experienced a lack of daily provisions at the camps and rest-houses on the way.

We entered Congo territory from Kabale, the last administrative post in Uganda, where we camped on the shores of Lake Bunyoni. I mention this locality as its faunal region is the same as that of the Parc National Albert. Dr. E. B. Worthington,† who was also exploring in East Africa in 1931, has published an interesting account of this region, and students are advised to consult his paper.

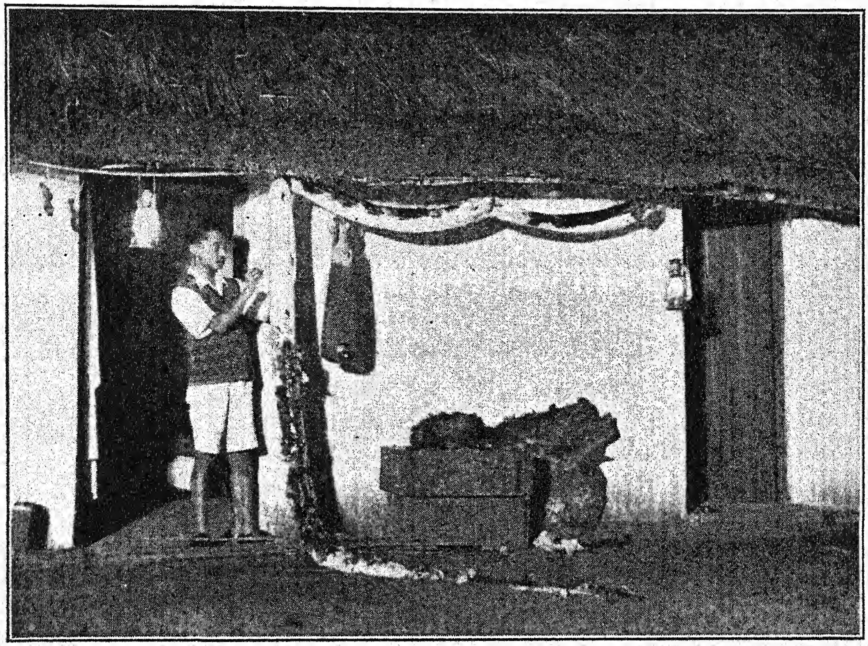
The beautiful Lake Bunyoni is covered with blue water-lilies, over the leaves of which, black rail (*Lymnocorax niger*), with yellow bills and large red legs, hop skilfully about. A flock of

* In his interesting paper, "Proposed British National Parks for Africa," *Geog. Jour.*, 1931, vol. 77, pp. 401–422, Major R. W. G. Hingston refers to the Parc National Albert and suggests that the extreme south-west portion of Uganda adjoining it should be constituted the Gorilla National Park (*loc. cit.*, p. 416).

† E. B. Worthington, "The Lakes of Kenya and Uganda," *Geog. Jour.*, 1932, vol. 79, pp. 275–293.

sacred ibis (*Threskiornis aethiopicus*), pleased our eyes, and the carrion-eating white-necked ravens (*Corvultur albicollis*) came within a few yards of our tent, searching fearlessly for food. The skin of a leopard killed locally showed that it belonged to the East African type.

Three days' march took us to the headquarters of the Park at Rutshuru, while the cars were sent there via Lake Tanganyika to traverse Lake Kivu. The sun was strong, although the altitude is 3800 feet. We found no mosquitoes, but tsetse flies



THE HON. M. HACHISUKA SKINNING A LARGE PYTHON CAUGHT IN THE JUNGLE AT RUTSHURU.

are numerous locally along the Rutshuru river and the shores of Lake Edward. The Ruanda * tribes graze their Ankole cattle on the plain. The horns of these beasts are magnificent and are said to be the largest of their kind in the world.

The Parc National Albert is divided into two parts: the one is in the north, an area of about 300,000 acres in the vast plains adjoining Lake Edward, and the other is the volcanic region rising from the shore of Lake Kivu. The water-mark of the latter is

* See J. B. Laws, "A Minor Adjustment in the Boundary between Tanganyika Territory and Ruanda," *Geog. Jour.*, 1932, vol. 80, pp. 244–249.

calculated to be 4380 feet. The mountain range is called "Birunga," and includes eight prominent peaks (two active and six extinct volcanic cones), namely: Nyamuragira, Nyiragongo, Karisimbi, Mikeno, Bishoke, Mugahinga, Sebyinyo, and Muhavura. It is a most gorgeous sight to behold their snow-capped peaks from Rutshuru, and the smoky glow proceeding from their craters by night forms a spectacle which is both magnificent and strange. Tinged with iridescent colours by the rising and setting sun, umbered by drifting cloud shadows, these ancient peaks present a panorama which can never fade from memory. Storms in this region easily spring up, and the wind frequently reaches a velocity of fifty miles an hour. Very often our tent poles failed to stand the strain. For aviators flying from Cairo by the South African hydroplane route, this part of the continent would be difficult of negotiation. Sir Alan Cobham tells me that, judging by his experience in 1931, it will be exceedingly difficult to fly across this mountain range from Lake Edward to Kivu.

Ankole Cattle in the Grazing Country North of Lake Kivu.

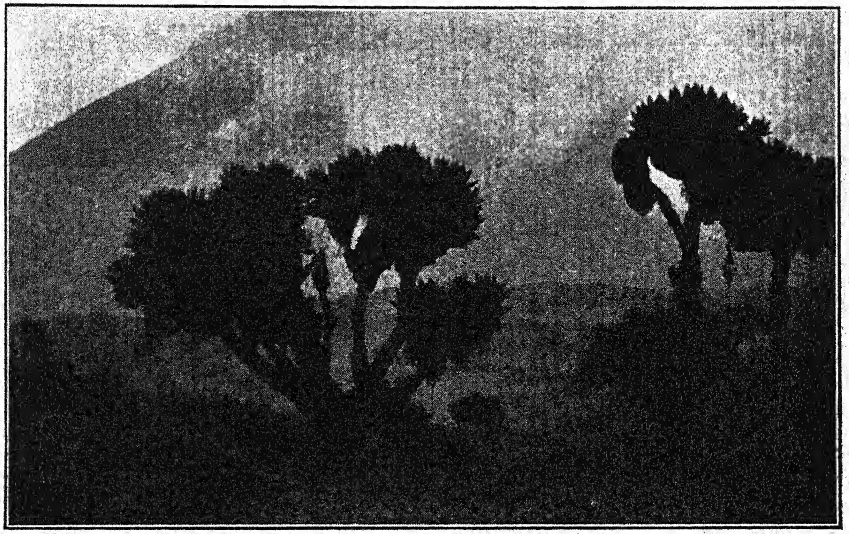
The horns are of gigantic size and are said to be the finest of the kind in the world.

Soon after our arrival at Rutshuru we had the honour of welcoming Prince Eugène de Ligne, at that time President of the Park Commission. His Highness motored through the Sahara in four days between Algiers and Goa. The Princess, who had chosen an easier way by flying from Cairo to Juba, took about the same time. At Rutshuru we got together a food supply for several weeks and engaged fifty to a hundred Bantu porters, together with the necessary blankets for their use, and were ready for the ascent to the volcanoes.

This southern reserve is best known to naturalists as the home of the mountain gorillas (*Gorilla gorilla beringeri*), the largest of their kind. Their less hairy relatives are represented in West Africa and other lower mountains in the Congo. The few sportsmen acquainted with these animals regard them as trophies on a par with lions and buffaloes. Several herds of from twelve to

thirty ngagi, as the gorilla is called by natives, may be encountered along the saddle between Mt. Karisimbi and Mt. Mikeno.

We made our collecting centre at Rueru, at an altitude of 9000 feet, just above the bamboo zone. It was here that in 1921 Count Gyldenstolpe, the naturalist attached to the Swedish Expedition led by H.R.H. Prince Wilhelm, also made an ornithological collection. As our porters already began to suffer from cold, we sent most of them down to the village. The only amphibian discovered was a small frog, *Phrynobatrachus graueri*, hitherto unrepresented in the British Museum collection. We

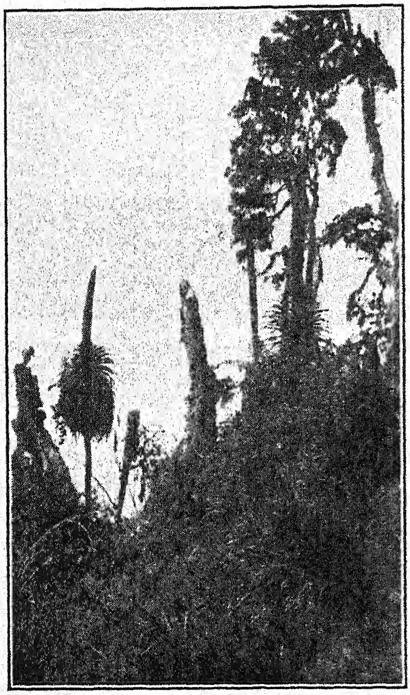


GIANT SENECIO AT RUKUMI (11,500 FEET).
The slope of Mount Mikeno is visible in the background.

found a chameleon, *Chameleon biteniatus graueri*, on mossy branches. It is amazing how a tropical animal can adapt itself to these surroundings. This is also a mountain species newly added to the Museum collection.

At the request of the Trustees of the British Museum a hunt was made for a gorilla's nest. The animal makes its track along the jungle, wide enough for a man to pass along. Sometimes, however, the track is not opened up overhead, but consists of a tunnel through the undergrowth. By following this, one eventually arrives at a bamboo grove, where the ground is fairly well cleared. Big bamboos are bent into a circle forming a platform about seven feet high. Branches and leaves, crushed and beaten flat, are bedded on top, the whole forming a comfortable

springy mattress, which we found to be strong enough to bear the weight of four men. This particularly fine nest was probably intended for the head of the gorilla family, for smaller, more crudely made, nests were scattered all over the place. One can easily imagine how a colony of gorillas live in the middle of a bamboo forest, well sheltered from the wind. A labyrinthine maze of tunnels radiating in all directions through the jungle gives access to their settlements. While protected by armed guards, I ordered my men to cut out the top part of a nest. It was then carried by four natives along a gorilla track which previously had to be widened in order to permit of unobstructed passage. In this manner we finally got it down to the bottom of the valley.



Lobelia and Giant Heather on Mount Mikeno (12,000 feet).

It has been said that the roaming habits of the gorilla will not permit of its occupying a nest for more than a night, but this statement is hardly justified by the fine craftsmanship displayed in the nests found. Several days must have been occupied in their construction.

A second type of nest was found in a lobelia forest. We did not collect one of these as the lobelia is really a herb, and the fresh green nests found on the ground would not have remained in the same condition when sent to England. A third type was found on the branch of a hagenia tree. Though this tree grows to an immense size, it has few branches equal to supporting the weight of a giant ape. On one tree two nests were discovered, but they were of a smaller type, being only about six feet in diameter. Situated about thirty feet above the ground, they were constructed of hagenia branches, and their style rather put me in mind of pigeon nests at home.

Several days were spent in getting the nest away. The tree had to be cut down and the nest encased in a huge ball of grass

and soft branches, lashed together with vines and creepers. Without this protective covering it would have suffered serious damage. The moss, lichens, and ferns growing on the tree were carefully preserved.

Altogether I examined about fifty nests, two of which were built on trees. The hagenia tree nest reached South Kensington safely, and, when the gorilla group in the Museum is constructed, it will give a good idea of this ape's habitat.

SECOND TYPE OF GORILLA NEST, IN A LOBELIA FOREST.

Mr. Marius Maxwell * has given a full and detailed description of the gorilla country, to which vividness is added by a number of illustrations, one of them showing the "night shelter" of a family of gorillas. I came across numbers of these places along the mountain slopes, particularly at the steeper points, but saw no trace of gorillas there. These shelters are of natural formation, and as such do not seem to appeal to gorillas, though they are used as hiding-places by some other animals.

Among the smaller mammals, hyrax were common, and two species of squirrel were by no means scarce. One of the latter is probably new. The specimens were presented to the Museum.

As regards birds, the bamboo forest is the home of a rare francolin (*Francolinus nobilis*), only known from the Birunga volcanoes and called ishoke by the Ruanda natives. We heard its call note and saw the imprint of its feet on the soft mud after rain, but not more than a few times did we actually see the bird itself shyly running through the undergrowth. As the region it frequents is quite uninhabited, natives know very little of its ways. Beautiful mountain touracoes (*Ruwenzornis johnstoni kivuensis*), with green plumage and soft crest, boldly flew over the valley, their leisurely flapping wings being ornamented with a flaming crimson patch. Very many interesting mountain birds were seen and collected. Among them may be pointed out a

* Marius Maxwell, "The Home of the Eastern Gorilla," *Jour. Bombay Nat. Hist. Soc.*, 1928, pp. 436–449.

species of weaver bird, *Cryptospiza shelleyi.* This species was made known from the Birunga by Count Gyldenstolpe, who secured one specimen. As soon as I had familiarized myself with its song and movements in the morning and evening, I secured a good series of them.

Gorilla Nest in a Tree.

Few trees are large enough to bear the weight of an adult.

Our next camp was at Kabara swamp, 1000 feet higher than Rueru. It may be recalled that Carl Akely, the collector for the American Museum of Natural History, met with an untimely death here in 1926, when he was working for the establishment of the Albert National Park. At this point hagenia trees were very abundant, while lobelia grew to the height of telegraph poles. The humid mountain mist made our camp very uncomfortable, while the natives were threatened by the nightly visits of leopards.

A leopard skin obtained here opened up an interesting question. One secured in the Birunga Range at an altitude of 6000 feet, when studied by Mr. R. I. Pocock,* was proved to belong to a special mountain race, *Panthera pardus ruwenzorii*, confined to the range and to Ruwenzori. It is characterized by its thick fur and dark markings, and is by no means distantly related to the race found on the high plateau of Abyssinia. The specimen, which I presented, is the first of the race to be added to the Museum Collection.

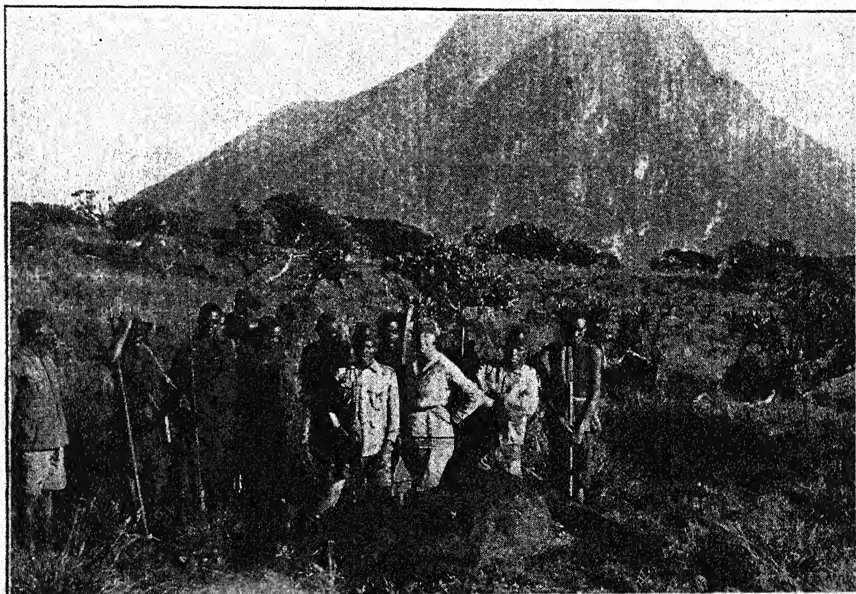
Nest of an Egyptian Goose at Rukumi (11,000 feet).

This is the highest altitude for a nest known in Africa.

At the height of 12,000 feet lions were by no means rare

* R. I. Pocock, F.R.S., F.Z.S., "The Leopards of Africa," *Proc. Zool. Soc. London*, 1932, pp. 543–591. The author's specimen is described on p. 569 and figured on plate iii.

during our visit, and we found a buffalo freshly killed by them. The buffaloes of these mountains have never been studied so far, and it is likely they will be of especial interest to students of this Alpine fauna. The few specimens which I examined were black in colour, both adult and calf. Adults are of a large size, like the animals of the plains, but the horns are peculiarly small and the fur is quite three inches long. The thickness of the fur differs according to the altitude, that of the animal from the high region



RUKUMI PLATEAU (11,000 FEET) ON THE SLOPE OF MOUNT MIKENO.

The buffalo in the foreground was killed by a lion. The vegetation seen includes Giant Heather, Senecio tree, and Ruwenzori Carex.

being quite long, as already stated. The fur of specimens from the shore of Lake Kivu, however, is very thin and indistinguishable from that of the inhabitants of the plains. So far as I am aware, the scientific name applicable is *Bubalus caffer matthewsi*, but the type locality is Kivu, the type being the lowland animal; the thick-coated animal will probably require a new name.

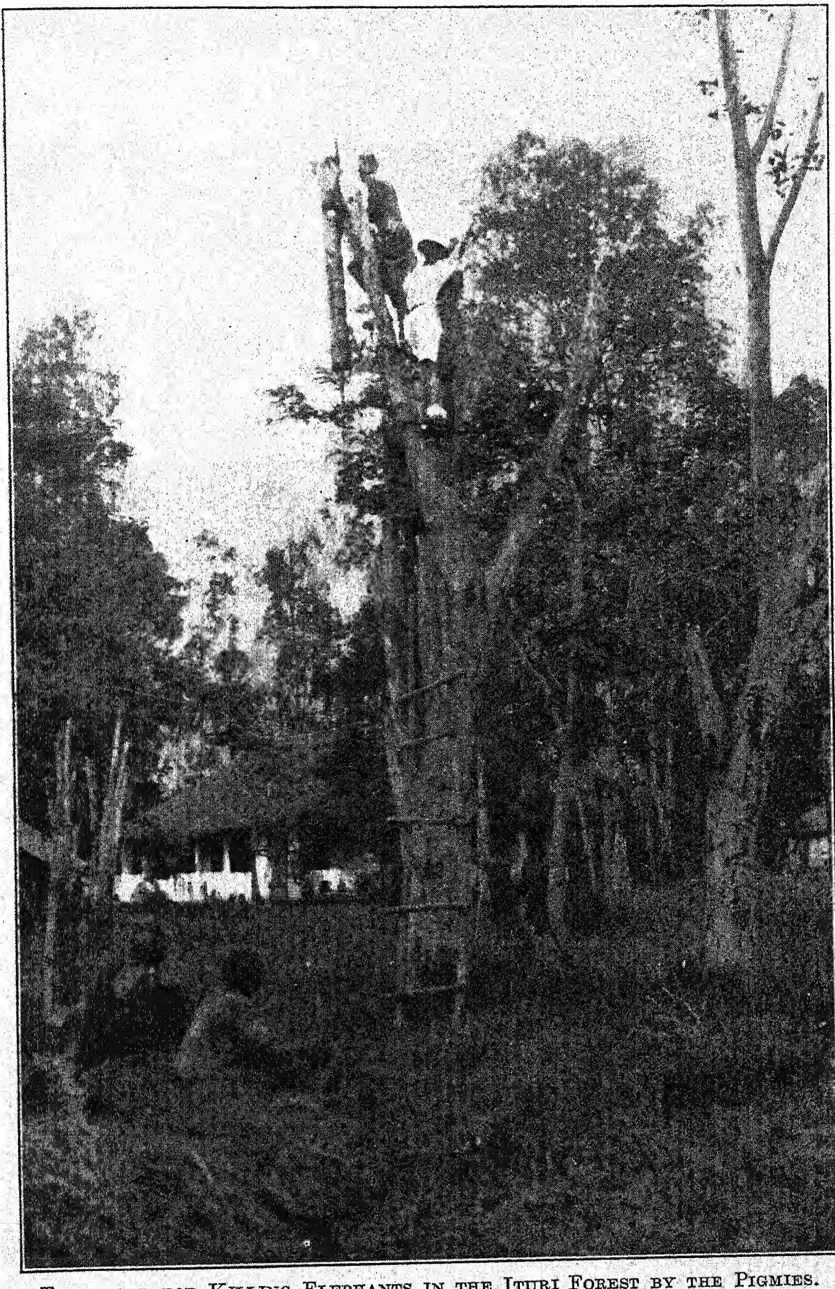
When the trip to the volcanoes was completed, we investigated the northern Park, which lies on the south shore of Lake Edward. This lake has not been visited very much as yet, but it is a perfect paradise for pelicans, snake-birds, goliath herons, egrets, hagedash ibis, marabou storks, hammerhead, white-

headed eagle, and geese of various kinds. It is estimated this reserve contains from 2000 to 3000 buffaloes, 4000 to 5000 hippopotami, 200 to 300 lions, 200 elephants, and from 80,000 to 100,000 antelopes (including topi, Uganda cob, reedbuck, waterbuck, bushbuck and duiker). Incidentally, I may mention that the hippopotami here are so tame that they hardly make way for canoes to pass. Fish abound in the lake. Most of these are cichlides, but there are also cyprinides and many lung-fish (*Protopterus*) that range in length up to four feet. Various methods are employed by the natives in catching the edible sorts, quantities of which are dried and later sold to the pigmies of the Ituri Forest, a considerable distance away. It is a most remarkable fact that no crocodiles are to be found in the lake, and in the Belgian reserve rhinoceroses, giraffes, zebras, ostriches, hartebeestes, and gazelles are non-existent, whereas all these creatures abound in the Masai Reserve, Kenya Colony.

BANTU WOMAN WITH HER BABY, NEAR LAKE KIVU.

The background shows rock strata.

I secured as specimens a very fine pair of defassa waterbuck, *Cobus defassa*; both of them possess sub-auricular "glandular" patches, peculiarities rarely found in any species of waterbuck. Altogether I have examined some eighty specimens in museums and in other collections, and only amongst two of these could I find this glandular development. One specimen, different in species from that collected by myself, came from West Africa, thereby proving that the glandular development is not a specific character. The genus *Cobus* usually lacks this characteristic, which is peculiar to a totally different genus, *Redunca*, embracing several species of reedbuck. Female skins are rare in collections, and the complete skin of my specimen is the only one known to be in existence which has this peculiar patch.

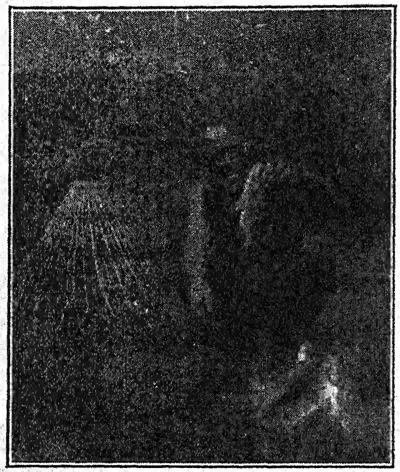


TRAP USED FOR KILLING ELEPHANTS IN THE ITURI FOREST BY THE PIGMIES.

The method was shown in the open because the Forest is too dark for photography. A spear, with a heavy wooden weight attached, is suspended over the path and is held by string set across the path. The elephant breaks the string in passing and releases the weighted spear, which falls upon the victim.

My specimens were exhibited by Capt. Guy Dollman * at the meeting of the Linnean Society held on February 18, 1932, and have since been presented to the Trustees of the British Museum.

The buffaloes living in the plain of the Park are similar to those found in South and East Africa throughout dry regions. They are large animals, black in colour, and with a magnificent spread of horns. In bulls this spread averages forty inches. The escarpment of the Mitumba Range at Kabasha is about 2000 feet above the Lake, and past this barrier the large buffalo is not known to travel. An intermediate type between itself and the red bush cow of the Ituri Forest replaces it here. The examples known to me are large in size and red in colour, and along the centre of the back have a peculiar black stripe. A comparison of these specimens proves that the buffalo is a sedentary animal, never ranging far afield. It may be mentioned in passing, however, that elephants are known to pass this escarpment from forest to plain, or vice versa.



NATIVE HOLDING FISH CAUGHT IN LAKE EDWARD IN THE TRAP SEEN ON THE LEFT.

This fish, when dried, is sold to the Pigmies in the Ituri Forest, a considerable distance away.

My return journey was made through the Ituri Forest to Lake Albert, where a fairly good motor road has recently been constructed. Along it are several privately owned hotels, so that travelling and transport present few difficulties, and tents and such-like gear are therefore not necessities along this stretch.

On reaching Butiaba I left by flying boat for Cairo.

* Capt. Guy Dollman, "Development of auricular 'glandular' patches in the Waterbuck," *Proc. Linn. Soc. London*, 1931–32, pp. 86–87.

BOOK NOTICES.

The Psychology of Animals in relation to Human Psychology. By F. ALVERDES. Translated by H. Stafford Hatfield. Pp. viii + 156. (London: Kegan Paul, Trench, Trübner & Co., Ltd. 1932. 9*s*.)

OF recent years biological speculation has, especially in this country, been largely in the hands of chemists—they are none the less chemists for the prefix *bio* to their designation—who seem to be incapable of distinguishing between their science and biology, or of mathematicians who by the very nature of their instrument abstract from their material all content except number. It is therefore heartening to find a book by a biologist—the author is professor of zoology at Marburg—who attaches some meaning to the concept of organism and treats his science as a branch of knowledge with standards of its own. In the beginning he explains his view of the organism as an actively self-maintaining unity on lines similar to those of J. S. Haldane, and enunciates a principle for the interpretation of animal behaviour. This principle is that the end determines the means or the whole determines the parts, and by the whole or end he implies the final state of some activity or process, the parts or means being the stages leading up to it. He is careful to explain that an end is not a consciously grasped objective, but simply the object which we regard as determining an observed biological activity. In the light of this principle he reviews a large number of observations on regeneration and on the behaviour, chiefly locomotive, of the less highly organized animal forms, protozoa, platyhelminths, echinoderms, and annelids. He shows for example that in the ciliated protozoan *Paramecium*, which has many thousands of similar locomotive organs, the cilia, when separated from the body, carry out independent motion of a completely stereotyped kind: but when connected in a normal manner with the living cell they always obey the unitary impulses proceeding from within. The ciliated protozoa, the free-swimming turbellarians and the starfishes have this in common, that their locomotive apparatus consists of a large number of similar individual elements, cilia or tube-feet, and these by working in strict coordination produce a unitary movement of the whole body. These animals supply illustrations of his principle that the end determines the means. For the end or whole is the locomotion of the body in a given direction, and to this are sub-ordinated the means or the parts, which in this case are the changes of movement of the individual cilia or tube-feet to meet the momentary situation.

He rejects the view that animals are the slaves of their surroundings or of their sense organs and have to react automatically to every external stimulus. On the contrary, he maintains that sense impressions are only guides to it. Of course an animal may be decisively influenced by an external factor such as an enemy, or by an inward physiological factor such as hunger or want of oxygen, but apart from such compulsions, an animal may act spontaneously. An animal may run, swim, or fly without any change in its surroundings, and whether, where and when it comes to rest are also decided in the first place by its spontaneity. This spontaneity he explains from the standpoint of hormic psychology as the expression of an original inborn drive present in all living creatures, which manifests itself in activity of all kinds. Incidentally he makes a detailed criticism of Loeb's theory of tropisms, and shows convincingly that it is not supported by the experimental evidence.

The problem of animal consciousness he regards as insoluble on the ground that we cannot form any conception of what the consciousness of an animal may be like; and it should therefore, he holds, be excluded from animal psychology. It would seem to be a logical procedure to assume some kind of consciousness in

animals analogous to our own when apparently conscious behaviour can be discerned. This is what, in fact, we do in our relations with other human beings. Moreover, he accepts von Uexküll's view of environment, and this view implies the presence of a sort of consciousness in animals. According to von Uexküll each species selects from its surroundings what is biologically important for it and what is capable of being grasped by its sense organs. Thus for an earthworm there are only "earthworm-things," for a dog only "dog-things," and so on. This is for the author the true environment, and two animals of different species under identical conditions have quite different relative environments.

The author belongs to the Gestalt school of German and Austrian psychologists and devotes a chapter to the explanation of some of its principles. The fundamental principle of Gestalt is that there is more in any psychological whole than the sum of its parts. The recognition of an object does not take place additively by the putting together of the separate sense impressions of its characteristics, but the object is grasped as a whole. The object, tree, chair, dog, or whatever it may be, is first apprehended as a whole and only afterwards its individual characteristics may be noticed according to the degree of attention given to it. The principle holds equally good for animals, and in the author's words, "the first alarm which the animal receives of the presence in its neighbourhood of an enemy, a prey, or a sexual partner, may be given by single data of one of the senses: hearing, sight, smell or touch; on the other hand, the way the new arrival is dealt with, the defence against the enemy, the attack on the prey, the act of copulation, is always a matter of the whole." This capacity to grasp things as wholes is an inborn thing and arises out of the inmost constitution of the organism.

He distinguishes between primary and secondary knowledge, primary knowledge being what is usually known as instinct and secondary knowledge being the knowledge acquired by practice and experience, and cites the large part that consciousness plays in, for example, human sexual action to combat the view that instinctive actions are unconscious. Primary and secondary knowledge are not to be regarded as opposed, for empirical knowledge helps to perfect primary knowledge, and certain types of activity such as nest-building are informed by both types of knowledge. Many instinctive actions are plastic and capable of modification by experience.

He calls attention to the fact that in our dealings with other human beings we have two methods of grasping their behaviour, that of understanding, by which he means a process of direct sympathy and comprehension, and that of explaining, which is mainly a matter of rational consideration and experience, and suggests that where the behaviour of animals is analogous to our own we may make use of the understanding and sympathetic method along with the explanatory in animal psychology.

The author contributes a very interesting chapter on animal sociology and puts forward the suggestion that animal matings, animal families and animal societies, provided that the constituent individuals during a relationship show themselves to be linked to one another inwardly, should be regarded as super-individual wholes. The behaviour of the individuals can then only be understood in the light of their relation to the larger unity.

It need hardly be said that this extremely interesting book covers a vast field. In fact it might justly be criticized on the ground that it deals with too much in too little space. The author, not content with biology and psychology and moved, no doubt, by the German passion for massive synthesis, introduces a lot of somewhat irrelevant metaphysical argument. He reveals himself as a follower of Vaihinger and a member of the *Als ob* school of Fictionists. This

school contends that mind, originally simply an aid in the struggle for existence, has outgrown its function. Thought is no longer a means to an end but an end in itself, with the consequence that the mind sets itself tasks for which it is wholly unfitted. The speculative reason serves like the Ghost in Hamlet to make us poor fools of nature so horridly to shake our dispositions with thoughts beyond the reaches of our souls. Reality is both unknowable and irrational, a statement which itself implies a knowledge of reality; and all our theoretical thinking, by which we attempt to introduce a unity into things, ends in the creation of fictions. According to the author, a fiction is a construction which renders intelligible diverse processes or events; and has, so to speak, no counterpart in the real. Thus causality, freedom of the will, mechanism, vitalism, the principle that the end determines the means and so on are fictions. We are, in the end, left with an impenetrable fence on one side of which are appearances and on the other the unknowable Thing. This is the old phenomenalist argument in a party dress, and the reviewer can only record his assent to Bradley's conclusion that "the assertion of a reality falling outside knowledge is quite nonsensical."

The Life of the Butterfly. By FRIEDRICH SCHNACK. Translated by Winifred Katzin. Pp. 278. (London: George Allen and Unwin, Ltd. 1932. 7*s.* 6*d.*)

THE thirty-five chapters of this entertaining and highly imaginative little book are devoted each to a separate species of butterfly or moth. "Of what dim intimations are they the luminous word? It may be they have brought us down the colours of the Paradise we lost, perhaps that was the earth from which they drew their roots, as the gates fell to which shut us out for ever . . . an angel sent a host of butterflies to follow us into exile . . . lilies whose gold we bartered for our folly's dress . . . abandoned speedwell . . . the clover of good omen gambled away . . . timeless sunflowers." This, extracted from the dedication, is a fair sample of the author's gently wandering fancy. But there is not a little to be learnt of the ways of butterflies from the careful observations of Herr Friedrich Schnack, to whom their appeal is both intense and unfailing; yet unless the reader is willing to follow him in kindred vein through his flower-spangled German meadows, his dark and ominous Jura and the scorching sands of the Sahara, dreaming of tales of Araby, finding in his butterflies the reincarnate heroines of Greek mythology, and Elysium in a mud-puddle surrounded by Purple Emperors, then he had better not read him. But there are Leander of the butterfly house, whose influence on the author is so great—a man able to produce gynandromorphs experimentally—and the glazier who spends furtive evenings painting fantastic butterflies for his own delectation; these provide themes of more mundane origin, to run through the book and furnish mounting stones to those higher realms of fanciful imagery where the author delights to let his mind wander unfettered. Yet the book is wholly delightful and has the added spirit of being both informative and accurate. The author is not to blame that some of his sprites are unrecognizable to the English reader under the names chosen for them by the translator, who, however, may readily be forgiven when there is set in the balance the charming performance of her main duties.

Snakes. By F. W. FITZSIMONS. Pp. xiv + 286, with 44 illustrations on 16 plates. (London: Hutchinson & Co., Ltd. 1932. 10*s.* 6*d.*)

THIS is not a book of natural history, but rather a collection of snake stories, ancient and modern, together with a good measure of advertisement of the

Port Elizabeth "Snake Park," its staff and its products. Snakes are only considered in their relations to man, and the more sensational or amusing these relations are the greater the gusto with which they are recounted. There is a great deal of reiteration and the literary style will not commend itself to the purist; but the most objectionable feature of the book is the unblushing "boosting" of secret remedies of unproved value.

MUSEUM NEWS.

His Highness the Aga Khan visited the Museum on November 25, and was received by the Director.

* * * * * * * *

The Principal Trustees of the British Museum appointed Mr. N. D. Riley Keeper of the Department of Entomology in succession to Major E. E. Austen, D.S.O., and Mr. K. G. Blair, B.Sc., of the same Department, Deputy Keeper.

Mr. Norman Denbigh Riley filled one of the new Deputy Keeperships created in 1931. An account of his career appears in this Magazine, vol. iii, p. 80.

Mr. Kenneth Gloyne Blair was educated at Highgate School and Birkbeck College, graduating with the degree of B.Sc. at London University in 1909. He joined the Civil Service as a Second Division Clerk, and was transferred to the Insect Section, as it then was, of the Department of Zoology as Second-Class Assistant (now Assistant Keeper) on November 30, 1910.

* * * * * * * *

Mr. William Plane Pycraft, Assistant Keeper, Department of Zoology, retired from the service of the Trustees on reaching the age of sixty-five on January 13. Mr. Pycraft was appointed to an Assistantship in that Department on July 5, 1907. Previously he was assistant to the Linacre Professor of Comparative Anatomy at Oxford University. He has had charge of the Osteological Collection at the Museum, and is well known as the author of many popular books on natural history subjects.

* * * * * * * *

The Trustees have promoted Mr. R. J. West to the Higher Grade Technical Assistantship vacated by the retirement of Mr. T. F. Vincent on December 20.

Mr. Thomas Frederick Vincent first joined the staff as a Boy Attendant on June 9, 1887, and thus had the exceptionally long service of over forty-five years, all spent in the Department of Mineralogy.

Mr. Reginald James West entered the Museum as a Boy Attendant on November 19, 1894; he is in the Department of Entomology.

* * * * * * * *

Mr. W. H. T. Tams, Assistant Keeper, Department of Entomology, and Mr. A. W. Exell, Assistant Keeper, Department of Botany, left England on October 1 to study and collect insect fauna and flora, respectively, in the Spanish islands, Fernando Po and Annobon, and the Portuguese islands, São Thomé and Principe. They are expected back about the middle of April.

* * * * * * * *

In connexion with the forthcoming expedition to Mount Everest an exhibition illustrating the natural history of the Himalaya Mountains has been placed in the Central Hall. The specimens were selected from those collected by naturalists on previous expeditions.

* * * * * * * *

From February 1 the earlier daily tour of the Guide Lecturer will be 11.30 a.m. instead of 12 noon. The afternoon tour will still be at 3.

ACQUISITIONS.

Department of Zoology.

The whole of the private collection of Alcyonarian corals belonging to the donor; presented by Sir J. Arthur Thomson.

An important collection chiefly of mammals and birds made by the donors in Upper Burma; presented by Lord Cranbrook and Capt. F. Kingdon Ward.

A rare marsupial mole, known to the natives as Arru-jarru-ju, from South Australia; presented by Mrs. Daisy Bates.

The skull of a small race of elephant from the Gola Forest, Sierra Leone; presented by His Excellency the Governor of Sierra Leone.

The skulls of two dugongs and a lioness collected by the donor at Mafia Island; presented by Mr. W. B. Savory.

The head of a fine mountain reedbuck shot by the late Colonel Sir R. Rankin, Bart., near Bloemfontein; presented by Sir H. Stewart-Rankin, Bart.

Molar teeth of a large bull elephant shot in Burma by the donor; presented by Major-General F. J. Marshall, C.B., C.M.G., D.S.O.

A collection of mammals from the South Cameroons formed by the donor; presented by Major P. H. G. Powell-Cotton.

A collection of heads, mostly of East African game animals, including a Lesser Kudu and a Bushbuck of exceptional measurements, shot by the late Mr. A. Neumann; presented by Mrs. J. D. Neumann.

Three leopards from Rajputana; presented by His Highness the Maharajah of Bikaner.

Skins and skulls of the snow leopard from the Gilgit district, Kashmir; presented by Capt. W. R. F. Trevelyan.

Skulls of a chita and a hippopotamus from Nigeria; presented by Mr. A. Miller.

A mounted specimen of an Irish wolfhound; presented by Mrs. Knox.

A mounted specimen of a Welsh terrier; presented by Mr. Walter S. Glynn.

A collection of 98 mammals from Honduras, including a squirrel and a hare new to the Collection; purchased.

A specimen of the rare flightless scaly-tail *Zenkerella insignis*; purchased.

Department of Entomology.

A collection, comprising over 17,000 specimens, including 430 types and 750 paratypes, of thrips formed by Dr. R. S. Bagnall; purchased.

A collection of about 8,000 insects of various orders but mainly diptera made by Miss D. Aubertin and Miss E. Trewavas in the High Tatra Mountains, Poland.

Department of Geology.

A large collection of invertebrate fossils from Madagascar, including a fine series of ammonites representing most of the local formations in the Jurassic and Cretaceous series; presented by the Director of the Geological Survey of Madagascar.

The collection of fossils made by Mr. H. St. J. Philby on his journey across the Arabian desert; presented by His Majesty the King of the Hejaz and Nejd.

A series of shells of Lower Tertiary age preserved in a remarkable kind of flint; presented by the Government Geologist of the Anglo-Egyptian Sudan.

Department of Mineralogy.

A large selection of pieces of meteoric iron with a total weight of 604 lb. and silica-glass and iron-shale found with them, from the meteorite craters discovered in 1931 near Henbury, Central Australia; acquired from the Kyancutta Museum, South Australia.

A fine mass of ruby, showing crystals grown in parallel position, weighing 690 grams (3450 carats), from the Ruby mines, Mogok, Upper Burma; purchased.

Specimens of the new mineral, bultfonteinite, from the Jagersfontein diamond mine, Orange Free State, South Africa; presented by Mr. Alpheus F. Williams.

Specimens of copper ores from the newly discovered deposits at Barrow's Creek, Central Australia; presented by Dr. Herbert Basedow.

Minute crystals from concentrates from platiniferous rocks of the Transvaal, including cooperite, laurite, sperrylite, platinum, and braggite (the last being the first new mineral to be discovered by X-ray methods of investigation); presented by Potgietersrust Platinums Limited.

Rocks collected by Prof. Leonid A. Kulik in 1927–1930 from the district in Siberia where the great meteorite fell on June 30, 1908; presented by Mr. R. Kirkpatrick.

An inlaid mahogany cabinet of ten drawers, containing 570 models of crystals in wood, also a pocket blowpipe, formerly the property of William Hyde Wollaston, F.R.S. (1766–1828); presented by Mrs. F. R. Wollaston.

Large polished slabs of orbicular diorite from Alderney; purchased.

A series of specimens of Norwegian minerals selected from the extensive collection of Tellef Dahll (1825–1893) and recent finds of Norwegian minerals; purchased.

Faceted black spinel from Siam; purchased.

Department of Botany.

882 drawings and descriptions of British Plants made by the donor's great-aunt, Miss Ellen Hawkins, who died in 1864; presented by Miss E. Hombersley.

697 specimens of flowering plants collected chiefly in the Lunda province of Angola by Mr. R. G. N. Young; presented by the Trustees of the Godman Exploration Fund.

49 specimens of Aegilops, which include all the known species of this genus of grasses; presented by Prof. John Percival.

The original manuscript and drawings of the Tabular Distribution of the Vegetable Kingdom by John Stuart, third Earl of Bute; presented by Mr. Reginald Cory.

A further set of Tanganyika plants collected by Mr. H. J. Schlieben; purchased.

668 specimens of Brazilian and Mexican plants collected by Mr. Y. Mexia; purchased.

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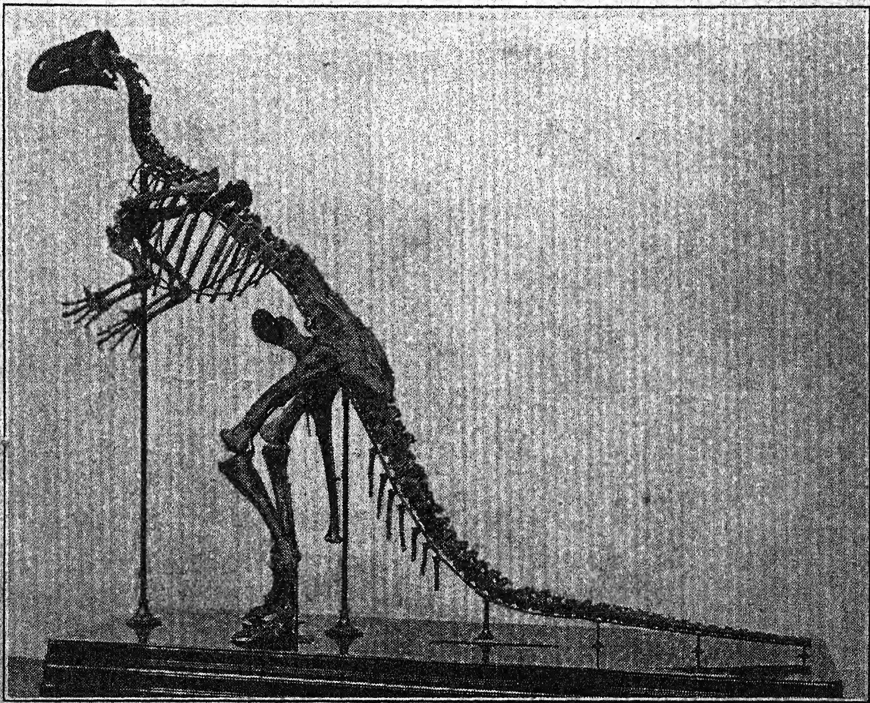
Price 1/-

NATURAL HISTORY MAGAZINE



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Natural History Magazine

No. 26 APRIL, 1933 Vol. IV

THE NATURAL HISTORY MUSEUM (DAS MUSEUM FÜR NATURKUNDE), BERLIN.*

By Prof. C. Zimmer, Director, Natural History Museum, Berlin.

The Natural History Museum (Museum für Naturkunde) at Berlin is immediately associated with the University of Berlin. When the latter was founded in 1809, Frederick William III, King of Prussia, decreed that the Royal Mineral Cabinet (Königliches Mineralien-Kabinett), which until then had been housed at the Mint, and the zoological collections of the Royal Art Cabinet (Königliche Kunstkammer) should be combined and placed in the University building, and henceforth should serve for the teaching purposes of the University and further be open to the public for their instruction and enlightenment.

The Mineral Cabinet had been founded in the year 1789, and at that time was made up of two collections bought by the State and one which had been presented. The Royal Art Cabinet contained among many divers objects a number of zoological specimens, among them being 40 mammals, 260 birds, the famous collection of fishes and reptiles formed by Bloch,† the Herbst ‡ collection of crabs, the Pallas § collection of Siberian fishes and amphibians, the Riemer || collection of insects, and two cases of shells. To these were added in the year 1810 as a gift the collection of about 1000 specimens of Brazilian mammals and birds belonging to the Graf von Hoffmannsegg ¶ and, likewise as a gift, the world-famous zoophyte collection of Gerresheim.**

In the year 1814 these collections were removed to the then newly-erected University building. There was, to be sure, not a great deal of space allocated to them, only four rooms for the Zoological Museum and even fewer for the Mineralogical Museum.

* Translated from the original German.
† Marcus Elieser Bloch, 1723–99.
‡ Johann Friedrich Wilhelm Herbst, 1743–1807.
§ Peter Simon Pallas, 1741–1811.
|| Riemer, nothing is known of him.
¶ Johann Centurius Graf von Hoffmannsegg, 1766–1849.
** Hofrat Dr. Adolf Gerresheim, ?–1812.

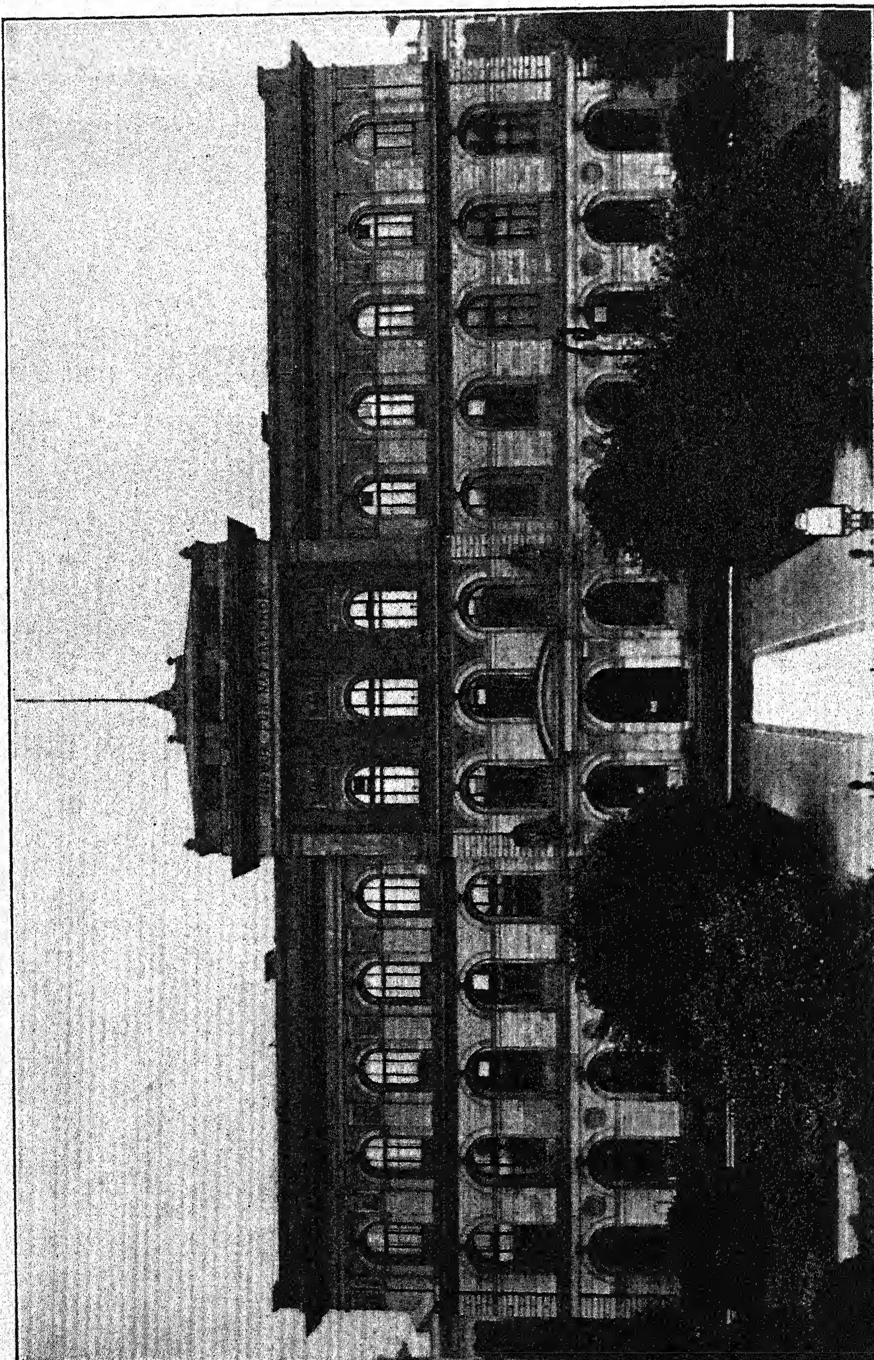


Fig. 1.—Natural History Museum, Berlin. Front

With the rapid growth of the Museums in the course of the nineteenth century more and more rooms in the University building had to be given up to them, until the time came when no further space could be found. The Natural History Museum was therefore built, and in the year 1889 was inaugurated as a new and worthy home for the Collections. The building still retains its original exterior form (Fig. 1), which is in the renaissance style of architecture, but it has been enlarged by an extension which was begun before the War and completed during its course.

The Natural History Museum forms, in conjunction with the Agricultural College (Die Landwirtschaftliche Hochschule), including the Agricultural Museum (Das Landwirtschaftliche Museum), and the Prussian Geological Institution (Die Preussische Geologische Landesanstalt), including the Provincial Geological Museum (Das Geologische Landesmuseum) and the Museum for Applied Geology (Das Museum für angewandte Geologie), a large group of public buildings in the Invalidenstrasse.

The Natural History Museum comprises the following four institutions of the University of Berlin :—

(1) The Mineralogical-Petrographical Institute and Museum (Das Mineralogisch-Petrographische Institut und Museum);
(2) The Geological-Palæontological Institute and Museum (Das Geologisch-Palæontologische Institut und Museum);
(3) The Zoological Museum (Das Zoologische Museum);
(4) The Zoological Institute (Das Zoologische Institut).

These four institutions are entirely independent of one another; there is no governing body in common and only a general control of the building, which, however, involves no interference with the administration of the several institutions.

The Zoological Institute provides for the requirements both of research and of the University, while the other three institutions deal in addition with the instruction of the public. The ground floor of the building is occupied by the general exhibition galleries, and on the upper floors are the store-rooms, offices, and studies. The floor-space is distributed as follows :—

	Square metres.
Zoological Institute	2250
Mineralogical-Petrographical Museum and Institute :	
Exhibition Collection	650
Reserve Collection and Studies	1630

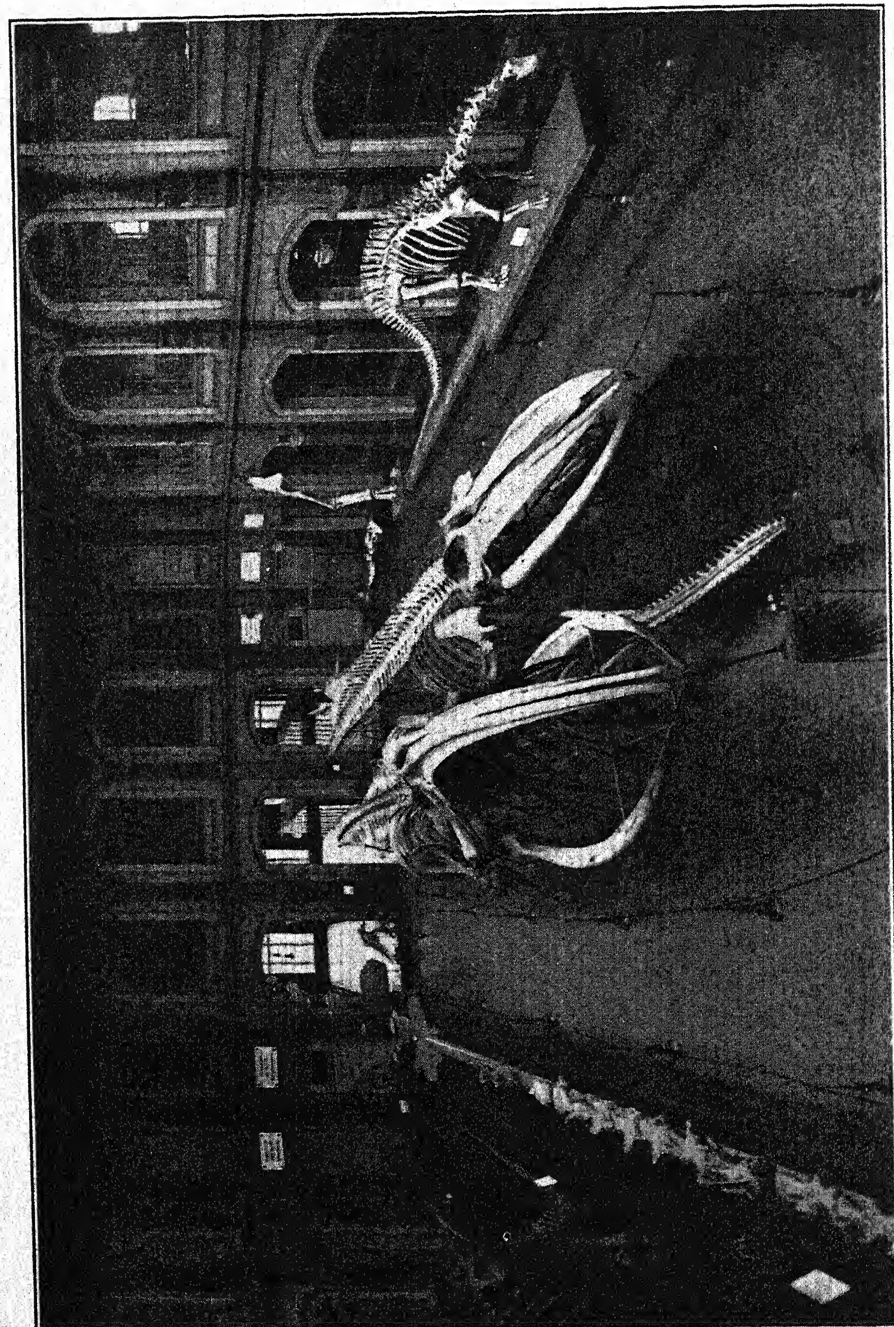


FIG. 2.—CENTRE COURT (LICHTHOF). CENTRE, WHALE SKELETONS; SIDES, SAURIAN SKELETONS.

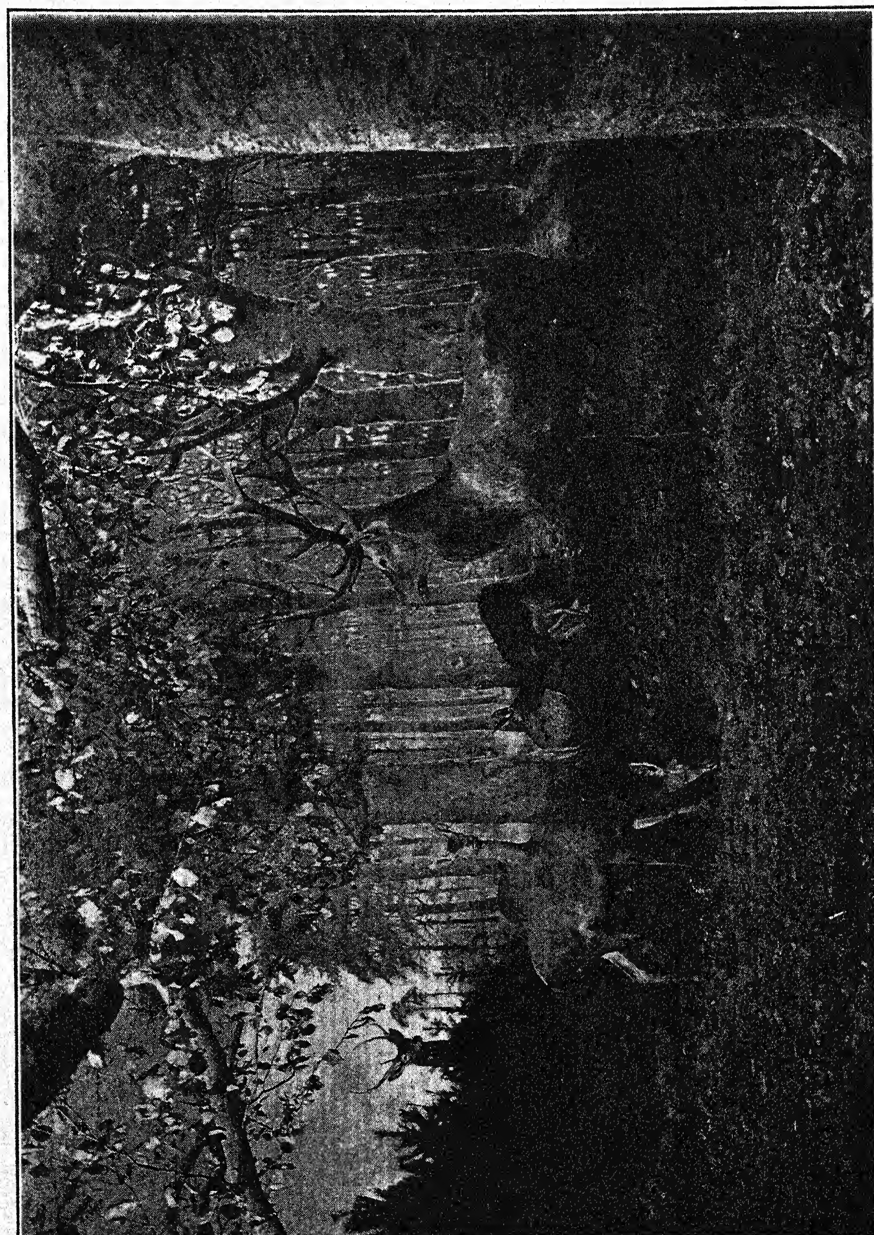


FIG. 3.—RED DEER GROUP, RIGHT HALF. (Animal Life of Germany series.)

	Square metres.
Geological-Palæontological Museum and Institute :	
Exhibition Collection	1050
Reserve Collection and Studies	2440
Zoological Museum :	
Exhibition Collection	5400
Reserve Collection and Studies	14510

The exhibited collections of the Mineralogical-Petrographical Museum occupy two galleries, of which the one contains a

FIG. 4.—PARTRIDGE GROUP. (Animal Life of Germany series.)

series of minerals arranged according to the mineralogical system, and collections of meteorites, radioactive minerals, gemstones, etc., and the other is devoted to igneous and stratigraphical rocks.

The exhibited collection of the Geological-Palæontological Museum is accommodated in two halls, and in addition shares with the Zoological Museum the large Centre Court (Lichthof), which, however, will eventually be devoted to the former only. Of the exhibition galleries the one contains a collection of fossils arranged by species, and the other a geological collection. In

the Court are accommodated large fossilized skeletons of mammals and reptiles, among the latter being the giant dinosaurs brought back by the Tendaguru expeditions.

By far the largest part of the exhibition space is occupied by the Zoological Museum. It comprises eleven halls as well as part of the Centre Court (Lichthof), in which are accommodated the skeletons of whales and various other animals of large size (Fig. 2). Of the specimens in the Zoological Museum, estimated to number upwards of twelve millions, only a bare quarter per cent. is exhibited; the remainder are stored in the reserve collection. The distribution of the eleven halls is as follows: Four to the Animal Life of Germany (Deutsche Tierwelt); two to mammals; and only one each to birds, cold-blooded vertebrates, invertebrates, comparative anatomy, and comparative biology. It should be noted that the halls are not of equal size, varying, as they do, between 235 and 670 square metres. This distribution of the material in the several halls is, however, not final, as the exhibited series of zoological specimens is undergoing a radical reorganization, the object of which is to render the exhibition galleries more instructive and more attractive to the public than they have been hitherto. The attainment of this object is being achieved in a twofold way. Less attention is devoted to taxonomy and more to biology; at the same time the provision of labels is increased, and they are couched in simple language. The task of reorganization is finished, or all but finished, as regards the German fauna, the preparation of the Biological Hall, and the rearrangement of the Bird Hall.

FIG. 5.—GRASS SNAKE AND COMMON FROG CASE.
(Animal Life of Germany series.)

In the halls devoted to the Animal Life of Germany (Deutsche Tierwelt) a large number of habitat groups have been set up, which show the animals in their natural surroundings (Figs. 3, 4, 5).

The Biological Hall (Biologischer Saal) has been arranged so as to afford, by means of a series of specimen models, pictures, and drawings, a comparative view of the mode of life of animals (Figs. 6, 7, 8). Some of the subjects dealt with in this hall are: Movement of Animals, Biology of Nutrition and Digestion, Biology of Propagation, etc.

The rearrangement of the Bird Hall (Vogelsaal) is to be taken in hand at once. Previously the whole of it was devoted to

Fig. 6.—Row of Cases in Biology Hall.

systematic ornithology, but now the exhibits are divided into two series. In the one the birds are arranged in systematic order, but the mode of life of each species is illustrated as fully as possible by the addition of the nest and eggs and by photographs of the living bird; this series, which occupies a run of 68 metres of upright cases, illustrates therefore the "special biology" of birds. The other series illustrates the "comparative biology" of birds, and is contained in upright cases extending to a run of 48 metres, as well as in window-cases, measuring 14 metres in length (Figs. 9, 10). By degrees the other halls,

which are at present devoted to systematic zoology, will be similarly rearranged.

In order to afford the working classes better opportunity for

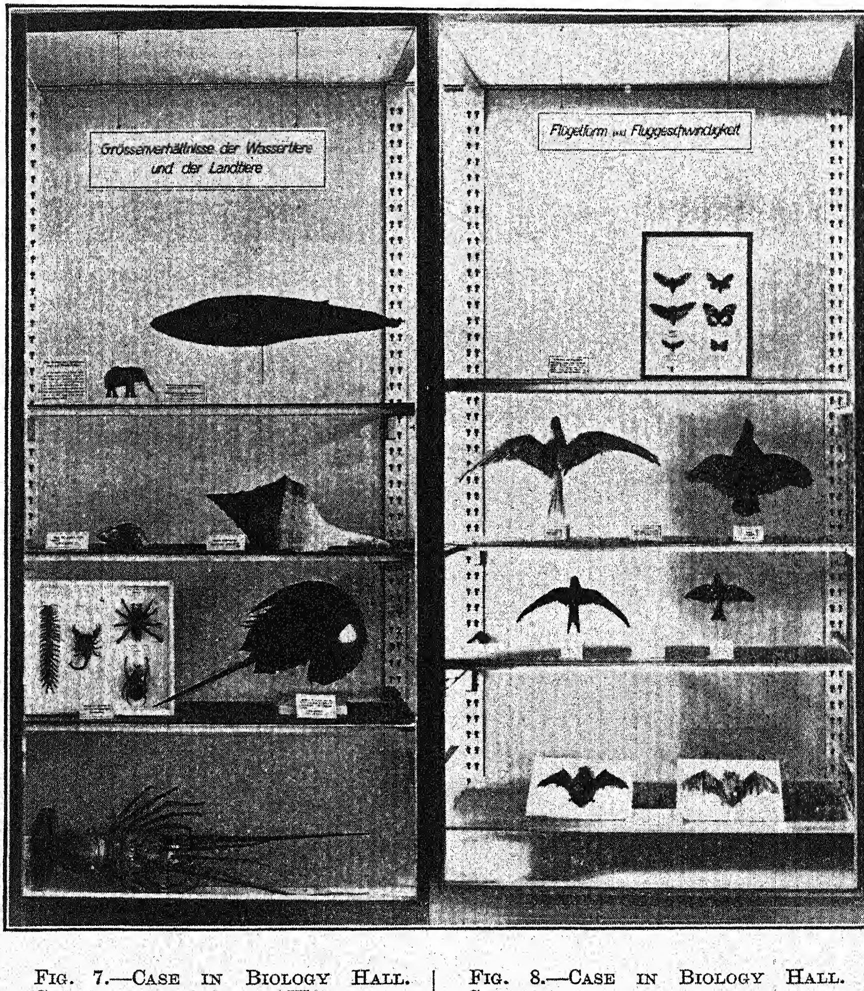


Fig. 7.—Case in Biology Hall. Comparison of size of Water and Land Animals.

Fig. 8.—Case in Biology Hall. Strong flyers have longer and sharper wings than weak flyers.

visiting the Museum, the exhibition halls have been open free on Wednesday evenings for some years past, and on these occasions free elementary lectures have been given by the staff of the Museum. The Lecture Hall of the Zoological Museum, in which the lectures took place, is unfortunately very small, containing only 250 seats, and so successful was the lecture

experiment that frequently the hall was crowded. Special exhibitions, too, have been arranged, which were changed every two or three months. All these enterprises, which were welcomed by all classes of the people, have been in abeyance since October 1, 1932, owing to the need for economy; but it is hoped that they will be revived so soon as times are better.

In the year 1867, when the constituent Museums were still in the University building, which is in the centre of the city,

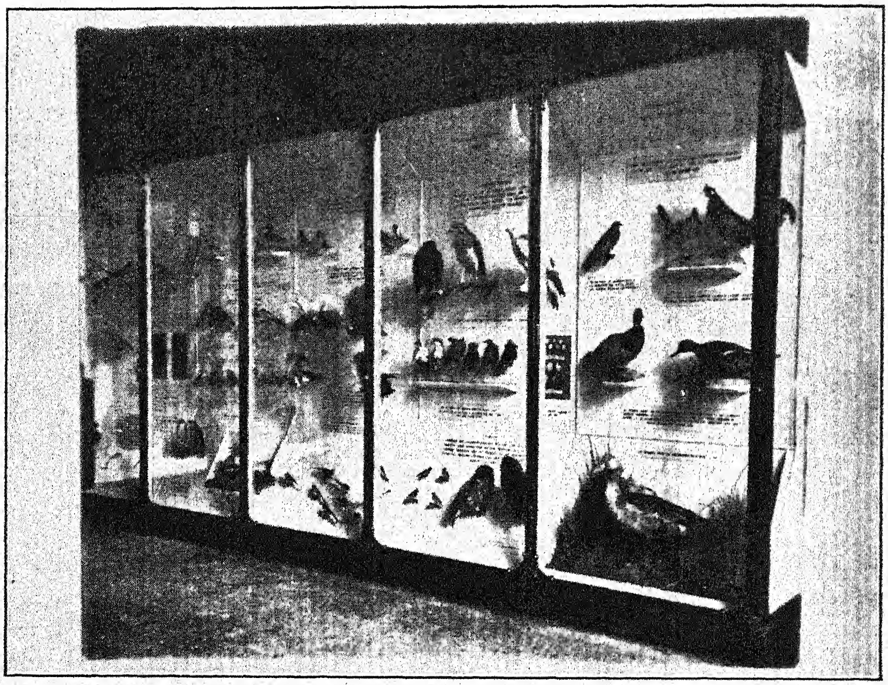


FIG. 9.—CASE IN BIRD HALL.

the number of visitors amounted to 40,000. At the present time the number is adversely affected by the unfavourable position of the Museum building some distance away from the busy traffic centre, so that despite the fact that the population of Berlin is from five to six times as large as it was in 1867, the number of visitors to the Natural History Museum has increased only to 60,000.

The hours of opening of the Museum are as follows :—

Winter: Sunday, Monday, Wednesday, Thursday, Saturday, 10 a.m. to 2 p.m.

Summer: Sunday 10 a.m. to 4 p.m., Monday 10 a.m. to 1 p.m., Wednesday 5 to 9 p.m., Thursday 10 a.m. to 1 p.m., Saturday 10 a.m. to 2 p.m.

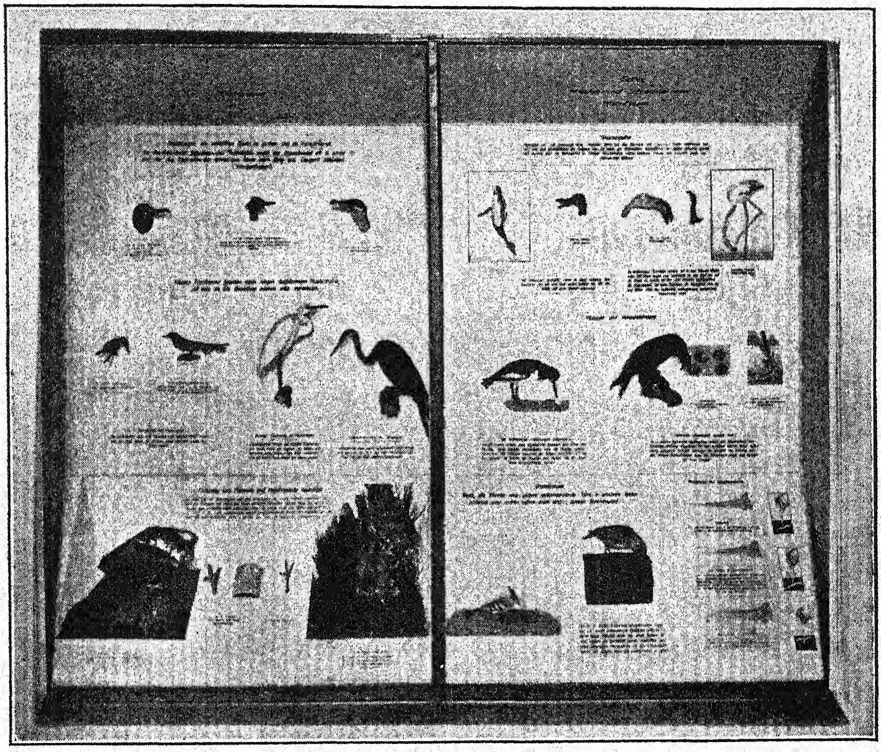


FIG. 10.—TWO CASES IN BIRD HALL.

Left, adaptation of feeding apparatus, etc., in fish-eating birds; Right, in filter-feeders, mussel- and snail-eaters, and worm-eaters.

On Monday and Thursday an admission fee of 50 pfennigs is charged; on the three remaining days there is no charge. School classes in charge of a teacher are always allowed free admission.

BEHIND THE SCENES IN THE MUSEUM. II.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

In the previous article * the general principles underlying the museum idea, and the function of the Natural History Museum in particular, were described, and something was said of the organization behind the exhibited series and of the methods by which these exhibits are interpreted for the public. In the strict sense perhaps these descriptions were not very much behind the scenes, except in so far as they supplied details or figures not readily obtainable by members of the general public. In this article and those to follow the duties of the Staff and the general activities of the Museum, in some form or another not directly under the public eye, will be described.

The Museum is a separate accounting department under the Trustees of the British Museum, and is administered by the Director. It consists essentially of five Departments—Zoology, Entomology, Geology, Mineralogy, and Botany—and the Director's Office with the house and maintenance staffs directly under its control. The work of the several Departments will be described later, and this article is devoted to the various duties of the Office and the sections under it. Firstly, there is the financial side of the Museum, the whole of which is dealt with in the Office, and secondly the staffs. Of course, although the scientific and technical staffs are directly responsible to the Keeper of their respective departments, the Office is concerned with the establishment as a whole, with the business of appointment, terms of employment, questions and payment of salary, and, alas, the deduction of income tax. The number of the staff thus affected is approximately three hundred, so that the internal administration is comparable with that of an average-sized factory, though there must be few industrial concerns which include so many various trades, arts, or crafts under one roof, or whose office contains an income tax department as well. Further, although every business of any pretensions must, or ought to, receive a large correspondence on its particular speciality, it is improbable that every conceivable aspect of that subject is dealt with. In the Museum the Office and Departments are under a constant bombardment of correspondence touching on every possible, and sometimes impossible, branch of natural history, and it may be of interest to know that within the last ten years the work of the Office and

* *Natural History Magazine*, Jan. 1933, vol. iv, pp. 15–19.

particularly its correspondence, has increased threefold, although the executive staff is larger by only about ten per cent. Those writing books or pamphlets, or attempting to do so; those anxious to give lectures, to identify specimens, or merely know things for the sake of knowledge or for the hope of gain, commercially or otherwise; or even the person who is worried over an animal or plant in a puzzle; all contribute to the ever-flowing stream that has to be arrested, diverted to its appropriate channel, and finally dealt with. The Office receives most of this material and deals with it, and the serious question or contribution then finds its way to the appropriate Department and authority.

It may be thought that there is nothing very remarkable in this and nothing outside the scope of the ordinary large office. In a measure it is true, for the Museum Office is run with the same efficiency and equipment as are to be found in a modern business. It is well to realize this, for there appears to exist in the imagination of some persons, principally cartoonists and humorists, the idea that museums are administered by old gentlemen, in whom the oldness is more pronounced than the gentility, and whose ideas of efficiency or modernity are those of the Dark Ages. In the National Museums, at least, it should be stressed that the Office is efficient and modern in administrative ability, and that to it are added the duties of a government department and the facilities of a general information bureau. The Office has never registered any particular objection to this last function, largely because it is able to satisfy almost every serious student and because it desires to be helpful to each and every intelligent inquirer; but it may be asked whether it is really economical for certain otherwise careful persons to spend stationery and postage, and cause a government department to do likewise, in the inquiry and answer of a trifling problem which could be solved by consulting a sixpenny dictionary or a shilling encyclopædia. This is a serious observation and any objection to it can be answered in the same way as can any complaint that we appear to have stressed too much the work of the Office. The National Museums are public institutions, provided from public funds for the enjoyment, intellectual or æsthetic, of the general public, and that same public has consequently some right to know with what efficiency and economy its institutions are maintained. In this connexion we may take note of a recent article in a daily journal on the cost of museums, in which the cost of an individual visit was assessed by the simple, but quite erroneous method of dividing the total yearly grant or expendi-

ture by the total attendance. If National Museums had no telephone or postal inquiries, no research work, no publications or students, such a figure might have some meaning; but in actual fact it is misleading. However, we shall discuss this main question in our final article.

Enough, however, has been said of the ordinary aspect of the Office; what are its other cares? Perhaps the most important of these, as they may be the most expensive, are the various expeditions which from time to time make collections in different parts of the world. Much of the organization of these is done in the Office as well as the treatment of the general reports and accounts when the expedition is in the field, although the specialist aspect of the plans and the results are looked after by the appropriate Department. What both those tasks mean can only be appreciated fully by one who has organized an expedition. Transport arrangements must be made, provisions obtained and planned for, the complicated scientific apparatus selected, and the tangled skein of political courtesies and facilities unravelled. The results may be good and may long interest and stimulate the layman or the expert, but there is one aspect of these Office activities usually forgotten. Many a youth in a merchant's office has dreamed a whole panorama of delight provoked by some correspondence from a far Eastern land. Visions of palms, and the imaginary aroma of all the spices hang on such a slender thread. What visions could not be raised from the contents of the letter-files of a large natural history museum! There are notes, brief and even uninteresting it may be, but from what sources and such correspondents! Lines written in the African bush, or in the backwaters of some tropical river; notes from the icy wastes of the Antarctic or the Arctic; a scribbled field-note from the upper heights of Mount Everest. Even there have passed through these same files the flimsy sheets accompanying some Antarctic rock specimens which were dragged on sledge to the Pole itself and found eventually with the bodies of that Polar party. Perhaps, after all, it is as well that prosaic correspondence outnumbers the romantic.

Leaving the handwritten or typewritten word we may turn our attention to the printed word. The many publications, catalogues, guide-books, and post-cards which the Museum issues are published through the agency of the Office, and the stores and public bookstall are directly under its control. This in itself is no light undertaking, for the annual turnover is very large and all the publications are in great demand both by the

public and museums. It is probably not generally realized that large quantities of the post-cards are every year sold to museums and printed under the names of these institutions. The material for the various cards and books is supplied generally by the Departments, but the actual publishing work is done in the Office, while the editorial work of this Magazine is also undertaken there. Packing, storing, or dispatch, and the reply to numerous inquiries, of course, occupy the whole-time attention of some members of the Staff. Of post-cards alone there are eleven hundred varieties in a stock of two millions, and more than one hundred thousand are sold annually. The Museum also does a large amount of its own printing, though it does not print any of the catalogues. All Museum labels for the exhibition and stored series are, however, done, and this naturally occupies most of the time of the printer. Any visitor knows that thousands of labels are on view, and it will readily be appreciated that even with the greatest care, they become dirty or faded and often out of date, so that apart from the steady demand for new labels a constant renewal is also required. Some of the labels are produced, in special circumstances, by His Majesty's Stationery Office. In addition to answering this steady and heavy demand the printer is required to produce many notices for circulation to the Staff and public, and advertisements of all lectures and publications. In fact, the duties would appear to be quite sufficient for the one man, which is the number that the Museum is now permitted to employ in this capacity. The equipment of the Printing Room (Fig. 1) is not suited for an increase in production as, of course, there is no linotype machine or power-driven printing press, and all the type is set by hand.

It has been mentioned that the printer does the advertisement notices of lectures, and these Museum lectures have already been described in the first article. But there is a further service done for lectures and lecturers by the Office; that is, the lending of lantern slides, of which a good selection is always available. Slides, some of them in colours, of such diverse subjects as protective coloration of animals, economic zoology, the evolution of elephants, camels, and horses, British birds and their nests, and minerals, can be had, and applications for a list, or for the loan, of them should be made to the Director. Approved lecturers can obtain these loans at a charge of two shillings and sixpence for twenty slides. Most of the slides in the collection have been made by the Museum photographer, who has no lack of employment in supplying the prints or

negatives required for many purposes by the Staff. The illustration of exhibits, scientific papers, and articles for this Magazine all demand not only good but also absolutely accurate photographs, and the objects may be microscopic or as large as, or larger than, an elephant. In recent years the photographer has had various quarters, but the recent addition of a splendid new hall for the exhibition of whales afforded an opportunity of rebuilding part of the adjacent building and making a corridor

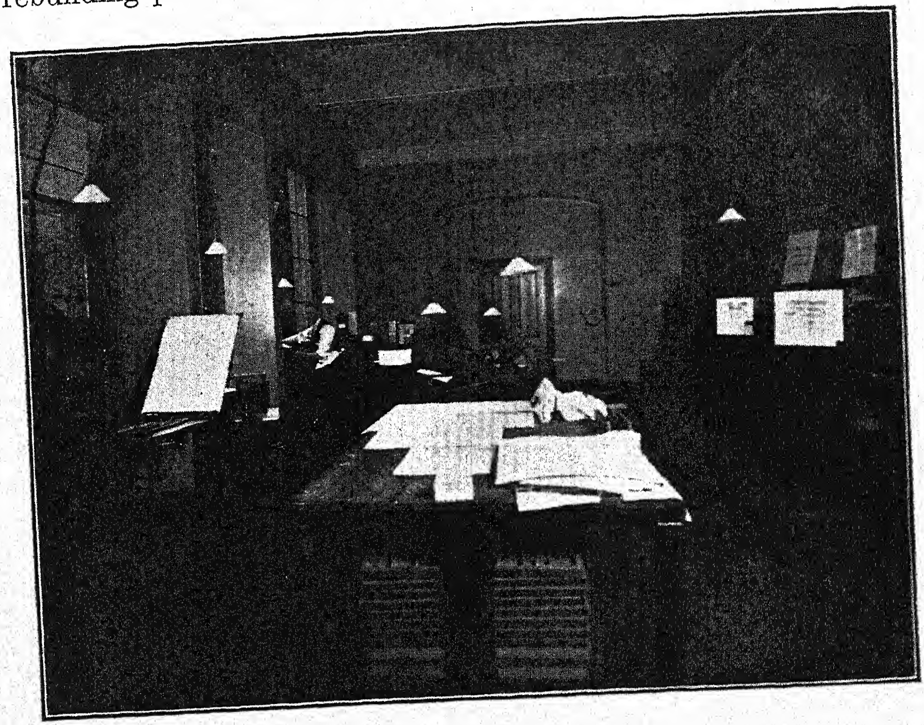
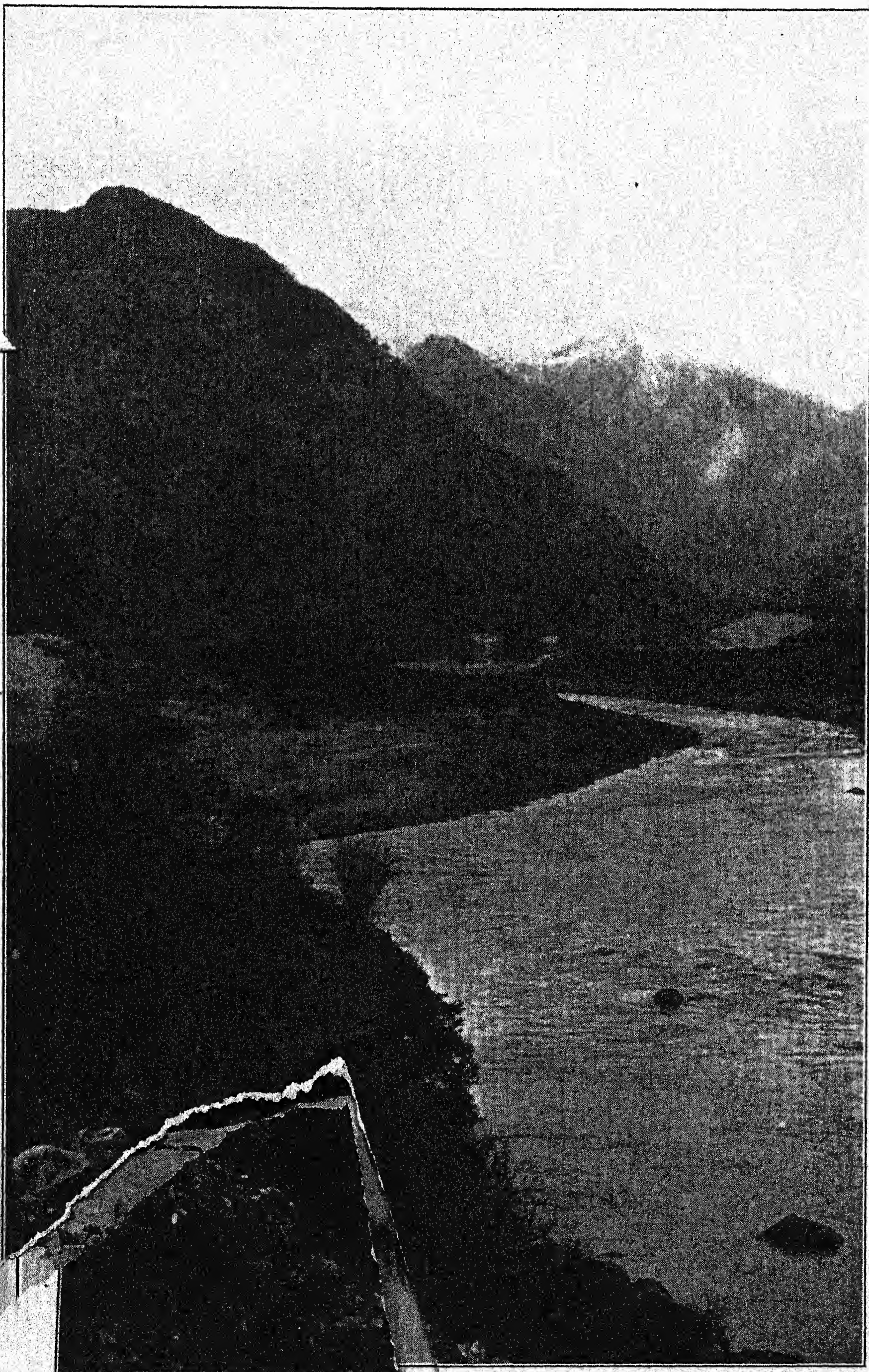


Fig. 1.—Printing Room.

between the two. The top of the corridor-bridge has been made into a fine studio with two dark-rooms (Fig. 2).

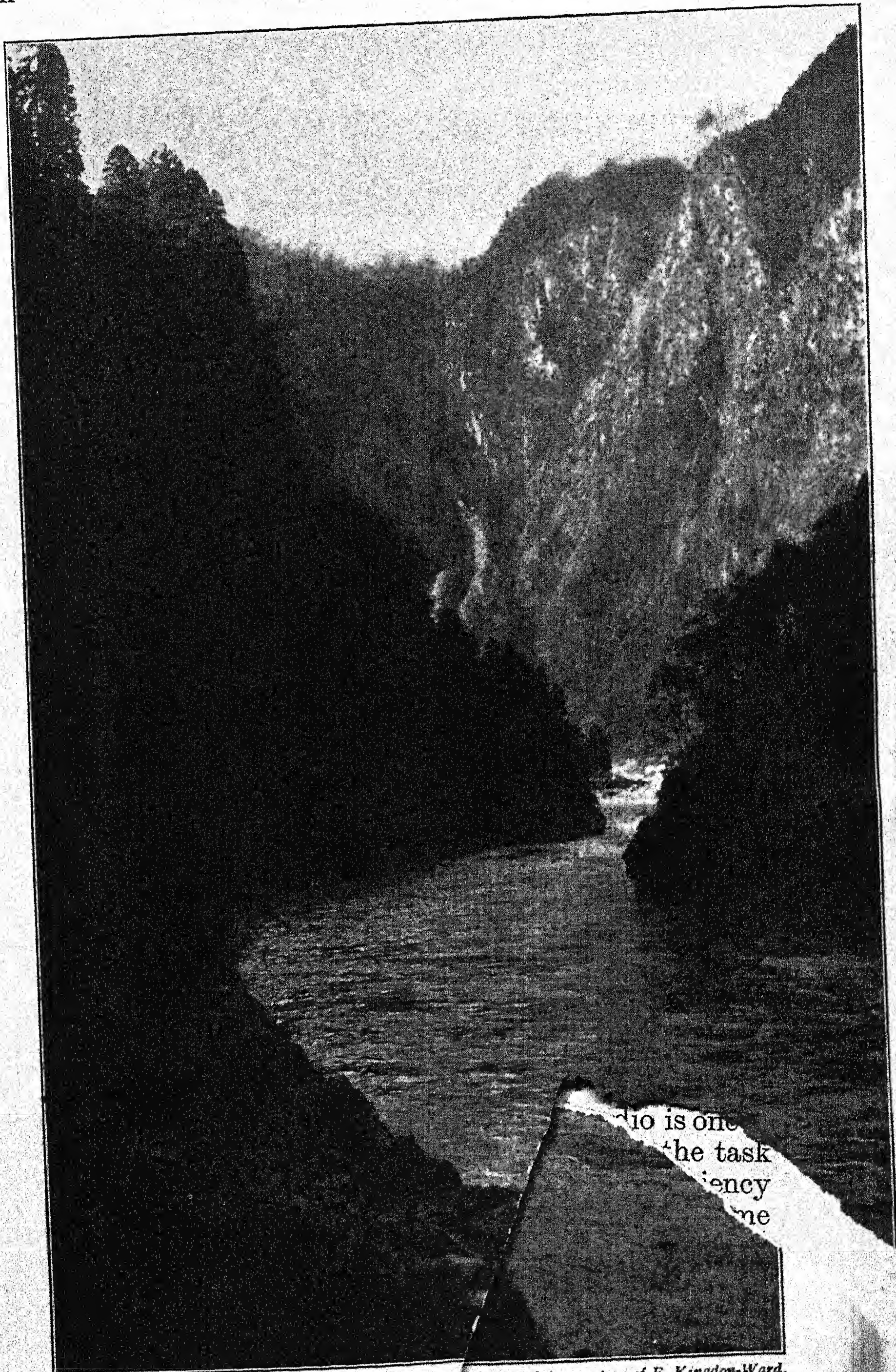
On the ground floor beneath the photographic studio is one of the most useful sections of the Museum, without which the task of every employee would be increased and the general efficiency greatly reduced. It is the telephone exchange, and merits some description, not only because of the constant use of the telephone but because so few people are conversant with exchange practice. During the hours of opening of the Museum the operator is a Post Office employee and not on the Museum Staff. The switchboard has at present one hundred and thirty-six extensions,



Photograph by courtesy of F. Kingdon-Ward.

GYAMDA RIVER, A TRIBUTAR HE CE TSANG-PO IN SOUTHERN TIBET.

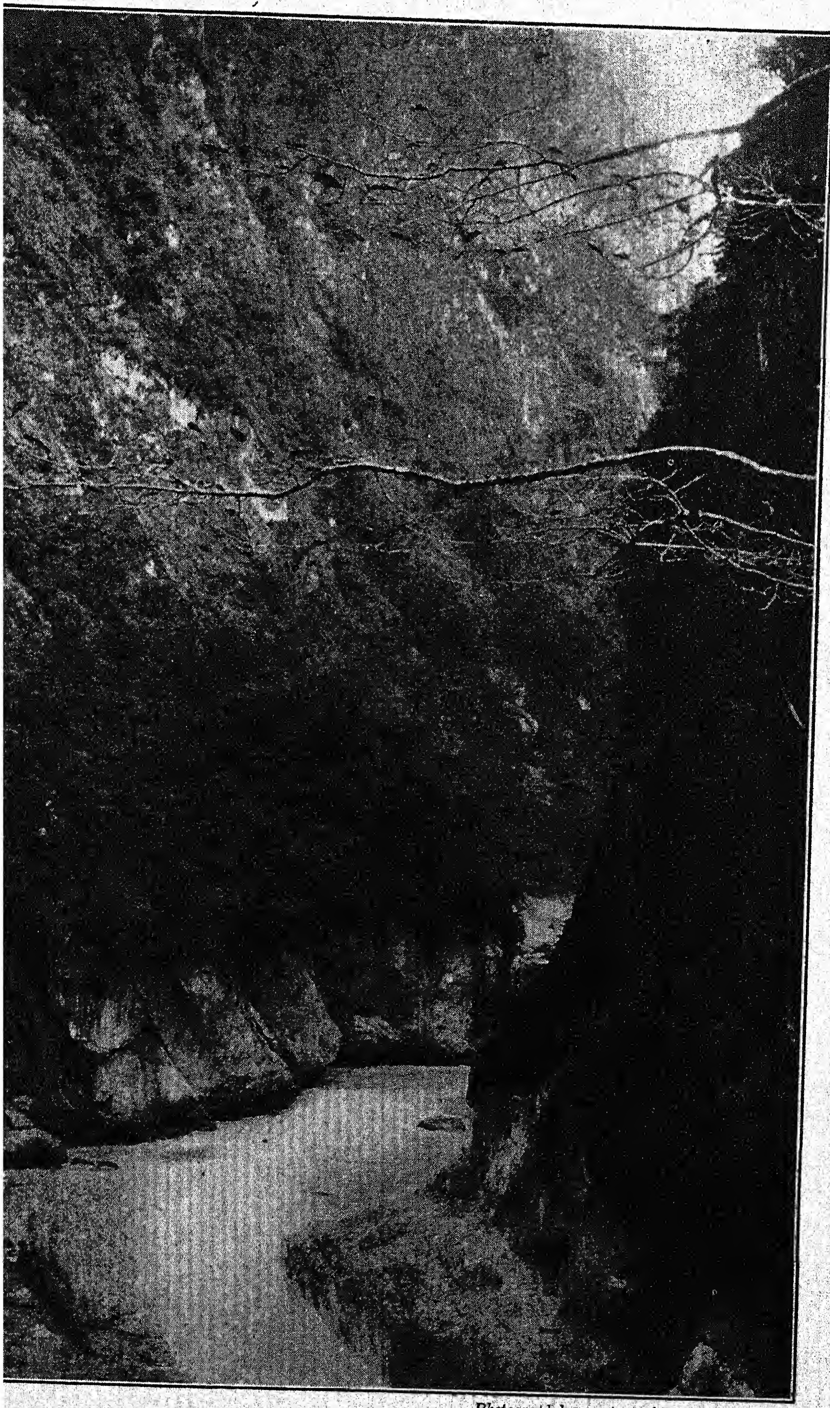
This part of Tibet is fertile and wel oss ed. There is good grazing, and cultivation.



Photograph by courtesy of F. Kingdon-Ward.

In the Heart of the Great Gor[illegible] Tsang-po-Brahmaputra.

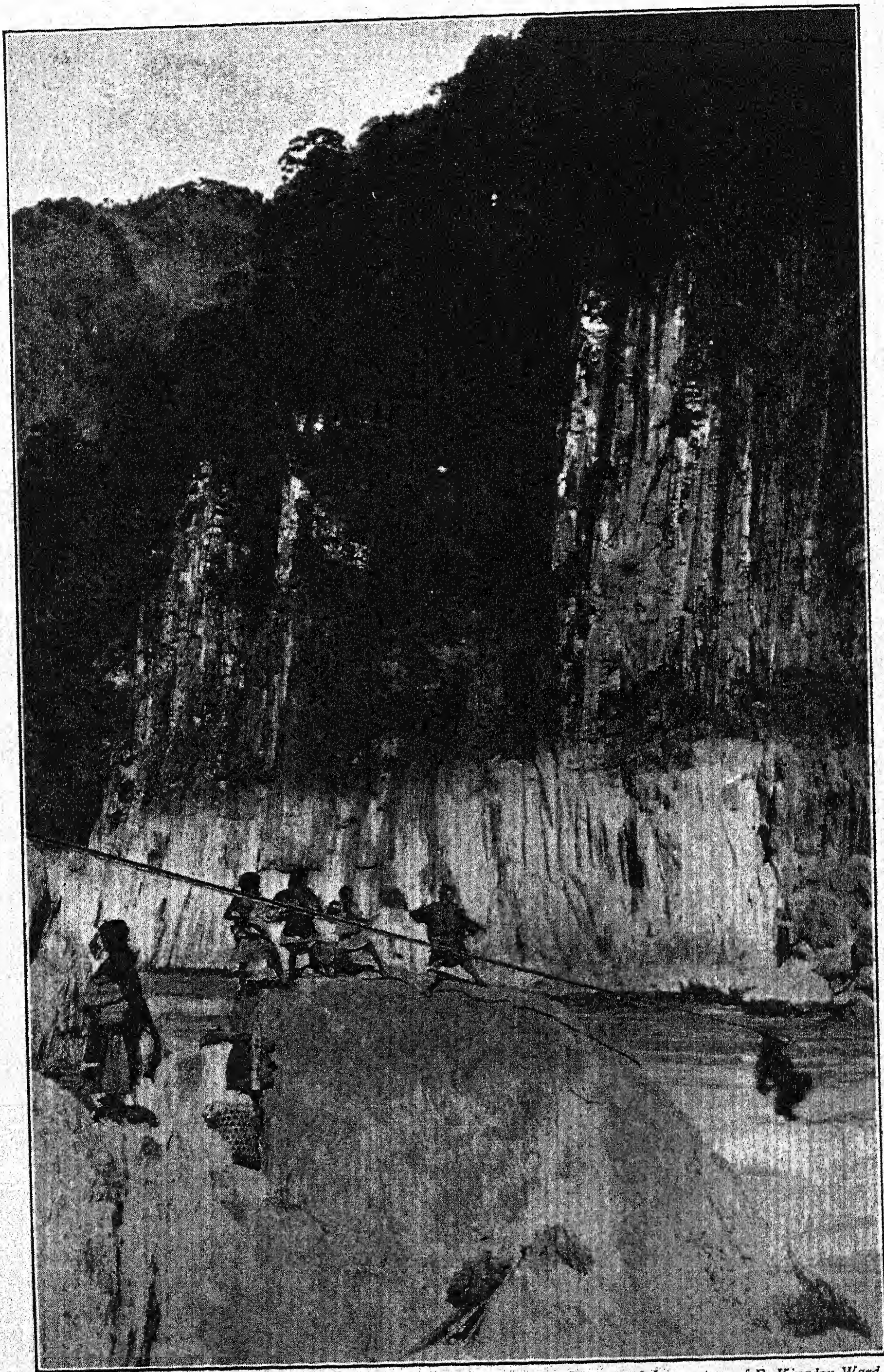
The Tsang-po, as it is called in Tibet, flo[illegible]asa at an altitude of 11,000 feet in a



Photograph by courtesy of F. Kingdon-Ward.

THE TIBETAN TSANG-PO IN THE CORE OF THE HIMALAYAN RANGE.

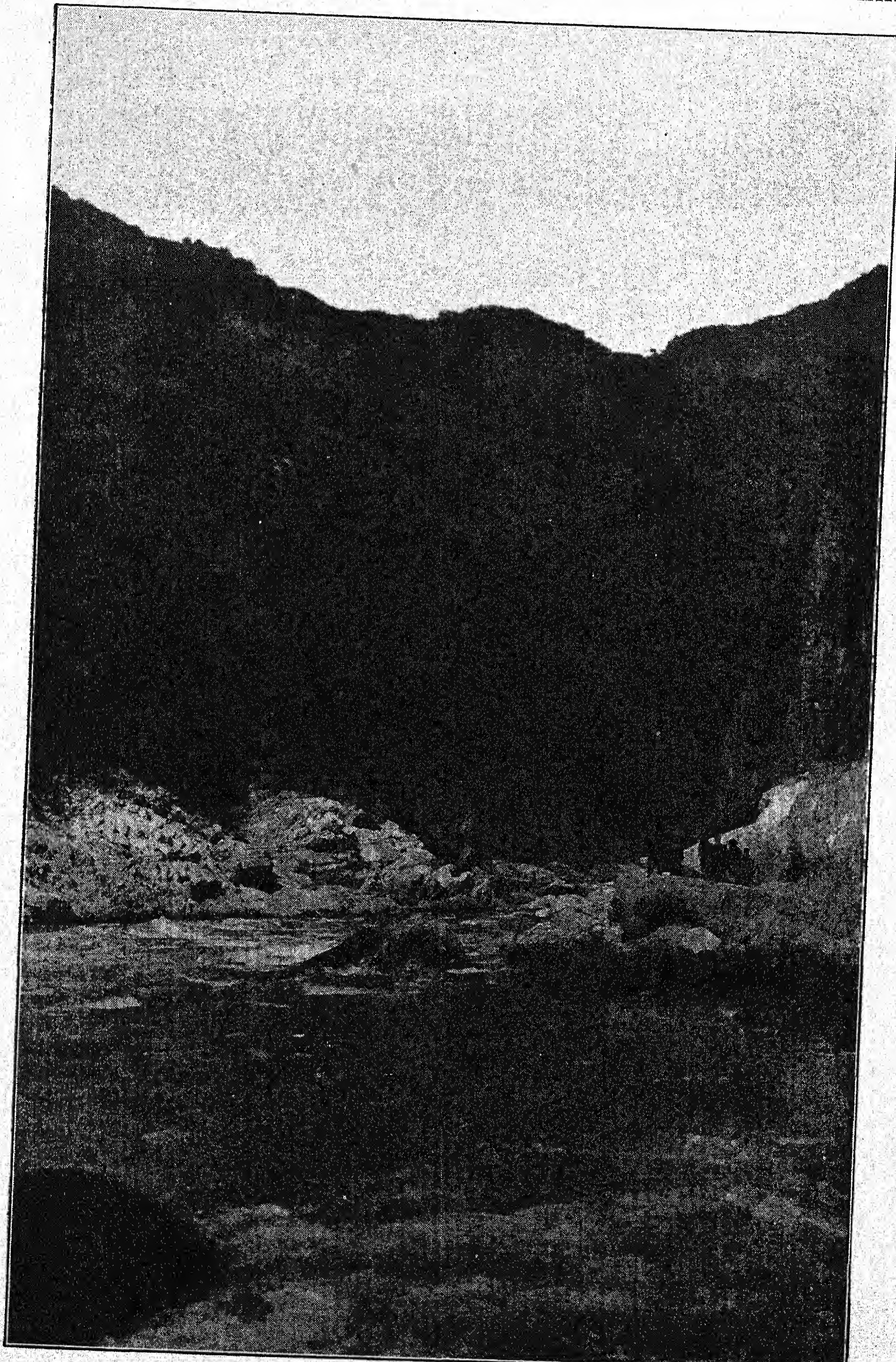
ang-po, which is three miles across near Lhasa, is here squeezed into a gorge
ardly fifty feet across.



Photograph by courtesy of F. Kingdon-Ward.

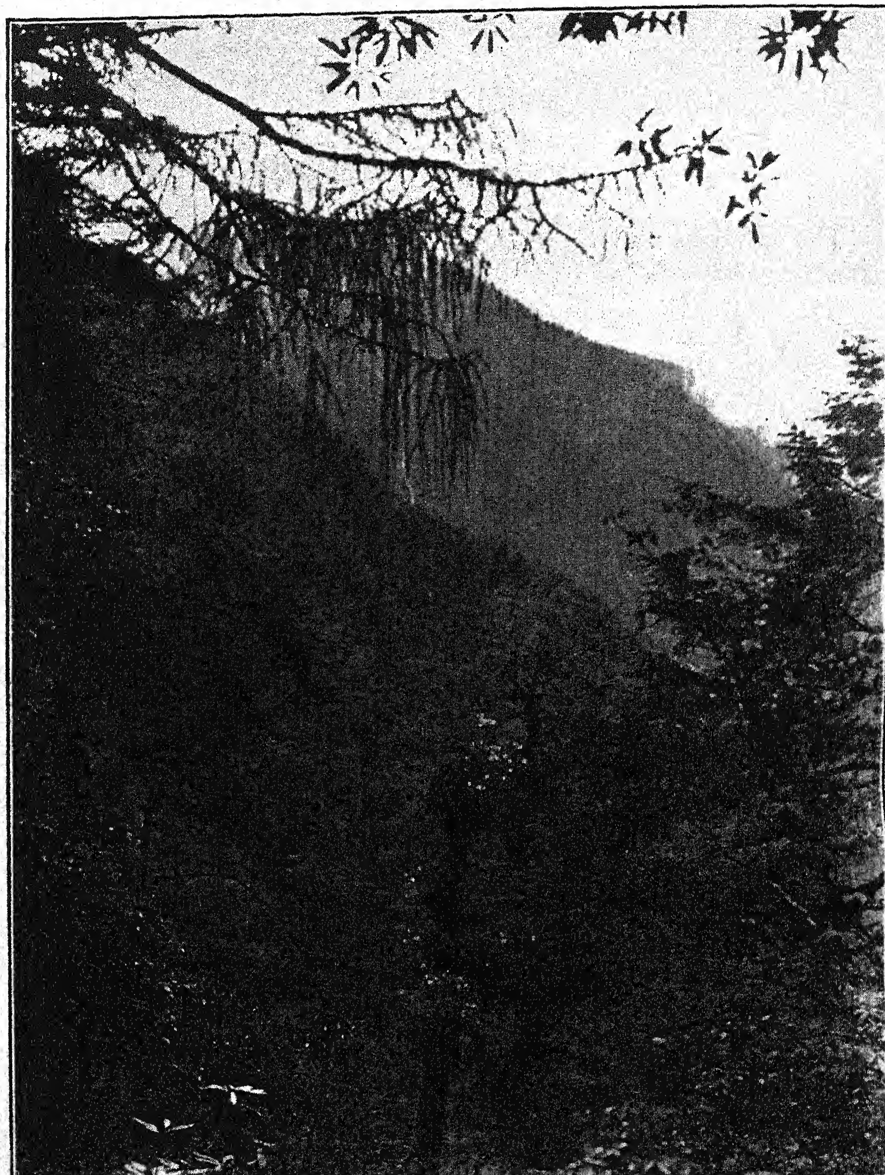
BAMBOO ROPE "BRIDGE" ACROSS THE TSANG-PO-BRAHMAPUTRA IN TIBET.

The rope is made of twisted strands of bamboo. A wooden slider, in the form of a half-
[illegible] from this slider by leather



Photograph by courtesy of F. Kingdon-Ward.

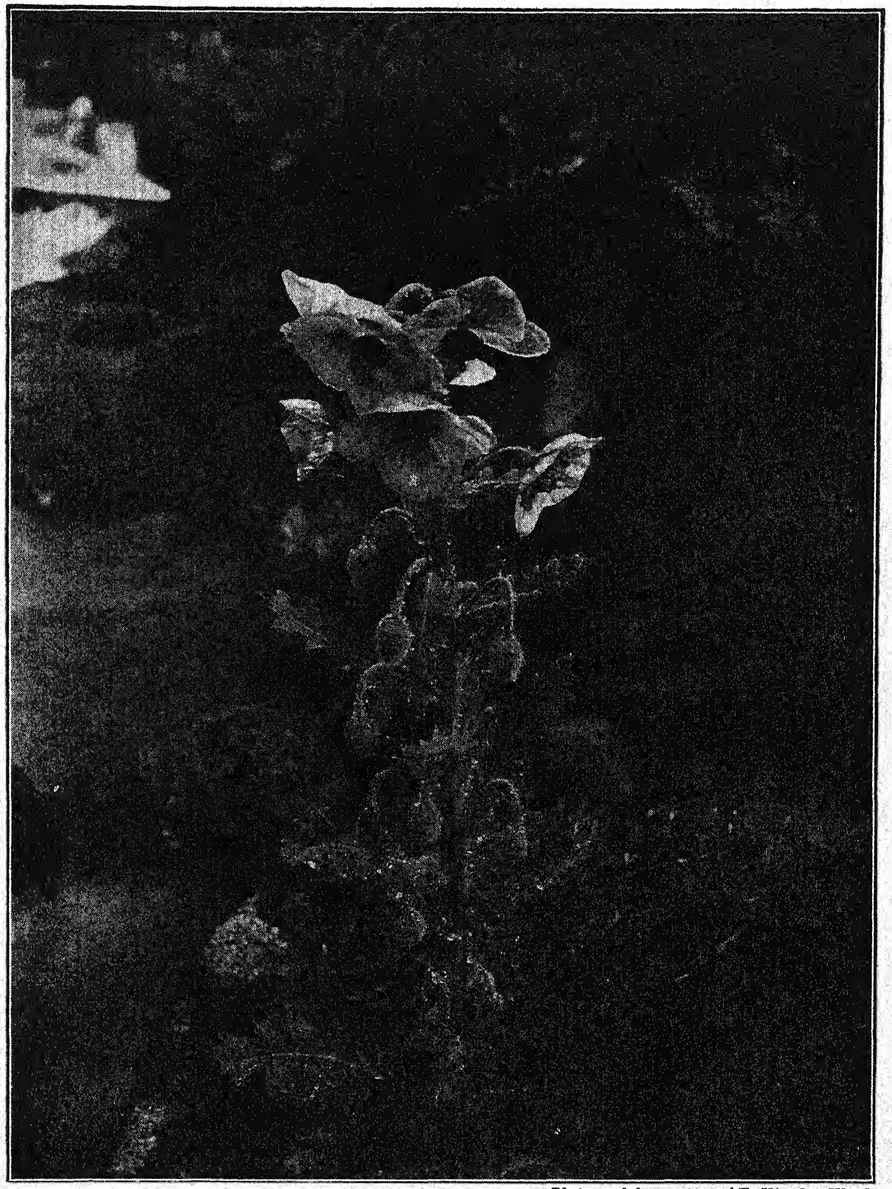
Side View of the Rope Bridge over the Tsang-po Rapids just below the great Gorge by which the River traverses the Himalaya Range.



Photograph by courtesy of F. Kingdon-Ward.

TEMPERATE RAIN FOREST ON THE ASSAM-TIBET FRONTIER AT 9000 FEET ALTITUDE.

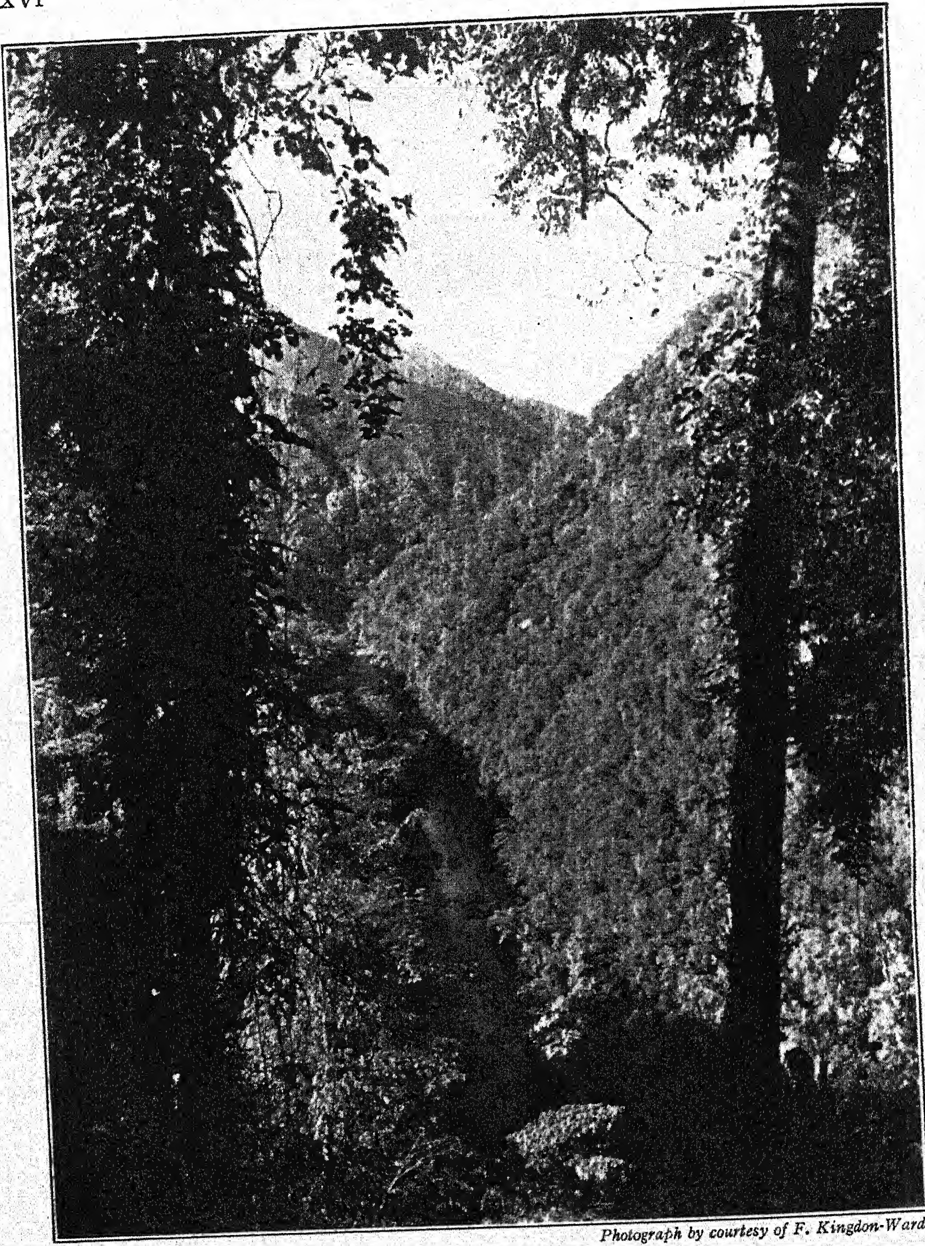
The forest consists of evergreen and deciduous trees. There are many Rhododendrons, some of which grow at the tops of the big trees, like Orchids; one such is seen in the middle foreground.



Photograph by courtesy of F. Kingdon-Ward.

Meconopsis violacea, a Violet Poppy growing in the Alpine Meadow near the sources of the Irrawaddy at 11,000 feet Altitude.

It is a near relation of the Tibetan Blue Poppy. The flowers are like silk, and five inches across.



Photograph by courtesy of F. Kingdon-Ward.

TAMAI RIVER, ONE OF THE HEADWATER STREAMS OF THE IRRAWADDY, ABOUT 1300 MILES FROM THE SEA.

The mountains are very steep, covered with dense forest (" hill jungle "). This region is very sparsely populated by uncultured tribes, who live partly by hunting. The snowy ranges of Tibet are seen in the distance.

five outside lines, one line direct to the Bloomsbury Departments of the British Museum, and other special lines, and is attended day and night, so that the building retains telephonic communication with outside points, ensuring that proper warding is possible and greater safety from fire or accident obtained. The average daily number of calls is three hundred and fifty, although larger numbers have been recorded over certain periods. A few years ago, when the crossword craze

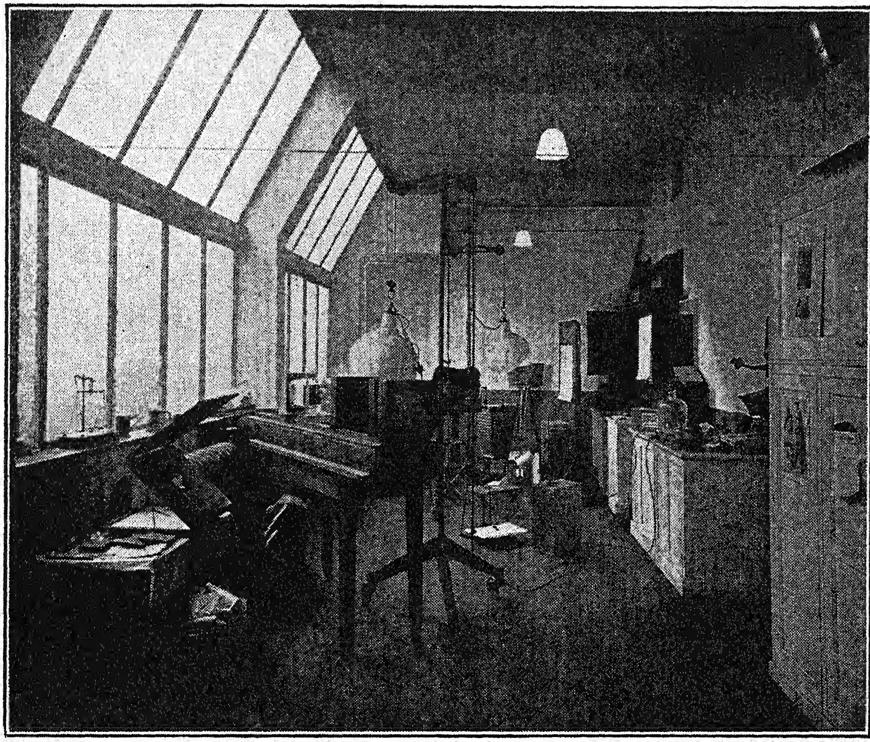


Fig. 2.—Photographic Studio.

swept over this country like an epidemic, there were large numbers of persons who thought of the Natural History Museum as the solver's great friend, and who found it easier to telephone to the Museum than to worry out names of beasts or plants beginning with so-and-so and ending with something-or-other. This attitude was speedily discouraged, but while it lasted the inquiry Departments of the Museum broke records. The switchboard, though in general practice used by a single operator, is suitable for use by two. In general shape (Fig. 3) it is some-

what like a small upright piano. The upright part facing the operator contains the "bull's-eyes" with numbered shutters, while the horizontal part contains the ringing and speaking switches and other little bull's-eye openings with white shutters. Between the two are the connexions for the plugs. When a receiver is lifted, the caller's number appears in the bull's-eye on the upright part of the switchboard, and attracts the operator's attention, so that she asks for the number required

Fig. 3.—Telephone Exchange.

as soon as she is free to do so. It often happens that many numbers are on the board at one time and the callers must be dealt with in sequence, as obviously they cannot all have their calls given them at the same time. The ensuing delay, in no way the fault of the operator, often results in the caller waggling the receiver hook, which means that the operator cannot possibly hear anything said and, in the case of the automatic telephone, immediately cuts off the connexion but registers a call which is charged for. The only excuse for giving this elementary piece of information is that so many telephone users have this habit, which produces precisely that result that they are trying to avoid.

When the operator knows the number desired, she takes one of the twin plugs, inserts it into the desired connexion, and presses the ringing key for a moment or so. The connexion is thus made and communication can take place. During the call two white discs appear in the bull's-eye windows associated with the connexion plugs on the horizontal part of the switchboard, so that the operator knows the numbers are still conversing. When the white discs disappear, she knows the call is over and accordingly pulls out the plugs. The procedure in the Museum is no different from that elsewhere, but, as the telephone is such an important unit in our organization and so helpful to Staff and public alike, it may be of interest to detail its ordinary operation.

Publicity is another function of the Office, and museums are not so inadequately advertised as one might suppose. Press notices, advertisements concerning publications and exhibits for posters, newspapers, and journals have all to be prepared, in addition to the routine work of preparing statistics, formulating reports and the hundred and one duties and problems associated with the administration of a government department containing several hundred different personalities.

The duties of the large maintenance staff, which also comes under the control of the Office, will be dealt with in the next article. Meantime, perhaps enough has been said to show that the Office of the Natural History Museum is as fully occupied and efficiently and economically run as the most tax-ridden member of the general public can desire.

THE SOUTHERN SEA-LION.

By J. E. Hamilton, M.Sc., Zoologist, "Discovery" Investigations.

Although the Southern Sea-Lion (*Otaria byronia*) has been known for about 350 years, and has been familiar to a very great number of people in that time, no complete and connected account of its habits and life-history has ever been written, and even descriptions of its physical appearance are inadequate.

This animal is one of the Eared Seals, the family which includes Sea-Lions and Fur-Seals. The Eared Seals are distributed around the entire globe in the sub-antarctic regions, and occur also on the Australian coasts, up the west side of South America, and on the Pacific coast of North America from California to the Bering Sea, across which they extend to the north-east of Asia. The Fur-Seals are far better known than the Sea-Lions, from which they principally differ by the possession of the lovely coat of soft underfur, which has brought them into publicity, romance, and death. The Sea-Lions occur in smaller numbers, and, being merely oil-producing animals, have not been so assiduously persecuted; their history, what one can pick up of it, is less the tale of lost rookeries than is that of their more valuable relatives.

Realizing the serious deficiency that existed in our knowledge of these animals, the "Discovery" Committee detailed me to attempt to fill it up. The Falkland Islands are a focus of population for the Southern Sea-Lion; so I was sent there.

The investigations necessitated a great deal of riding round the islands, since some rookeries can only be approached from the landward side, on account of their positions on exposed beaches, and entailed camping as near as possible to the animals for weeks at a time. "As near as possible" means about five minutes' walk for a man and perhaps fifteen minutes for the sea-lion, who takes frequent rests; at times the animals did come over and go to sleep on the camping-ground. One thus became positively intimate with the species.

The Southern Sea-Lion is one of the largest of its race. The full-grown male is about 8 feet long from the tip of the nose to the end of the tail, and, when they trail behind him, the hind flippers will extend another 2 feet or so. The shoulders, neck, and head are greatly developed, and are so enormously muscular that the animal looks as if the fore-flippers were about the middle of its length, while the hind-quarters look ridiculously small and light compared with the front part of the body. The neck is covered with rather long, bristly hair, which gives it a peculiarly shaggy appearance. Combined with the deep and powerful

voice, this character has gained for the animal its popular name, which was in the earlier days shared by the Elephant Seal. The colour of the male varies greatly; it may be almost black with a slightly lighter mane, dark brown all over, dark brown with a mane which is almost straw coloured, an almost greenish grey with the same light mane, and I have seen one specimen which was an extremely pale buff, almost cream colour over the whole of the body, neck, and head. The females are much smaller, being about 6 feet in length, and, although possessors of long and flexible necks, they are completely without the massive

Fig. 1.—Tamar Pass, West Falkland.

Part of a breeding rookery, showing males, females, and pups, on flat rock.

development of those parts which makes the males so imposing; their variations in colour nearly correspond with those of the bulls. It may be remarked here that, in accordance with the vocabulary of bygone sealers, the male is a "bull," the female a "cow," and the young, rather surprisingly, a "pup." The pup is a blackish chocolate-brown at birth, but at the end of the first year has usually become a dull brownish-yellow, which soon turns to a reddish-brown, the characteristic colour of the immature seal. In young seals colour variations are not noticeable, but with advancing age the general tendency is to lose the reddish tinge and, for the males at least, to become darker.

The sea-lions are generally found on the beaches, which are of two kinds: those at the foot of cliffs, and those on the seaward side of belts of the tussock grass (*Poa flabellata*), which grows luxuriantly on numerous islands, where the sheep have not been able to destroy it. At such places the edge of the land is usually sloping, and the sea-lions can easily climb up and find comfortable places where they can sleep completely sheltered from the furious winds of the Falklands. It has at times happened that I have been compelled to walk over and through tussock where sea-lions were known to be, and there is a distinct element of excitement in this, since the grass may be well above one's head and tangles before one's face, so that it is impossible to tell if the next step will flush an infuriated bull or only a harmless pup, which will rush off bleating with terror. Some of the cliff-foot beaches are not really worthy of the name, being composed of aggregations of huge blocks of rock which have fallen from the cliff above, and lie in tumbled masses dipping down to the water. Although such places are almost completely exposed to the sea, sea-lions will choose them for rookeries, although it is impossible to see where they can land in a strong on-shore wind. It seems not unlikely that the thick coat of blubber may act as a defence against a battering by the waves as well as against the bite of the chilly water.

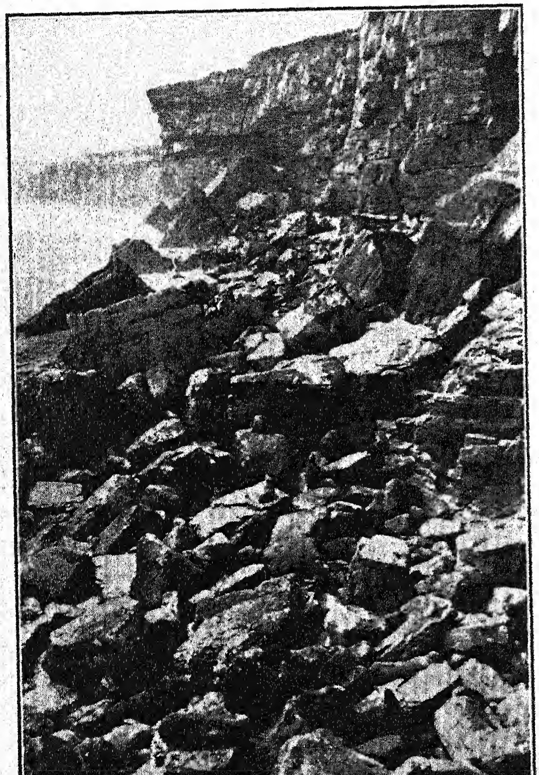


FIG. 2.—CAPE MEREDITH, WEST FALKLAND.
A rookery on cliff talus; even in life the sea-lions can be picked out only with difficulty.

On the whole, however, the sites selected for breeding have some sort of off-shore protection in the form of rocks or perhaps beds of the huge kelp of the Southern Ocean (*Macrocystis*), which

spreads its fronds on the surface of the water and effectually damps the breakers of all except the worst gales. There is no particular preference for one sort of surface or another; shingle, boulders or flat rocks seem to meet with uniform approval.

Among the Eared Seals polygamy is the rule, and our species is no exception. It is the aim and pride of a bull to secure as many cows as possible, and, since the sexes exist in about equal numbers, there are clearly not enough cows to go round with this system, with the result that during the whole breeding season there are in progress continuous and savage struggles for supremacy. Each bull picks a place on the beach where he intends to form his harem, and there he remains, waiting for the cows to collect around him. As they do so, neighbouring bulls attempt to seduce them from their allegiance, but meet at once with resistance from the lawful proprietor, and the result is rather like a dog-fight on an imperial scale, the two bulls involved dancing backwards and forwards in front of one another, sparring for an opening, snarling and snapping so that one can hear the great teeth clash together when a bite is missed, or fended by the jaw of the opponent. Very often the fight gets no farther, but if by chance one does gain a hold, he keeps it, and, when both combatants find a grip, they start using their weight, and it is then a case of the heaviest bull winning. Eventually one gives way and, turning, flees as fast as possible, pursued by his infuriated enemy, who often tries to inflict further damage on the thin skin behind the front flipper. Every bull within biting distance has a snap as the conquered one retires, but his principal antagonist does not chase him far, lest another poacher arrive on the scene. The harems vary from one cow to ten or twelve cows in number, but those which contain only one are in the minority. The sea-lion is a very gregarious creature, and at all seasons of the year is fond of living in crowds. When the breeding season comes in the summer, it does not abandon the custom, with the result that the harems are all crowded together on the beaches, and it is often impossible to say where one begins

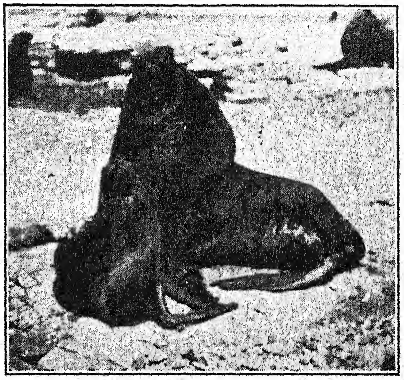


FIG. 3.—TAMAR PASS, WEST FALKLAND.
An adult male with cow at the beginning of the breeding season.

and the other ends. Only the bulls, sultans as they are, know well, and they discourage exploration by their own cows or by the neighbouring bulls.

Nothing takes place on the rookeries without snarls and roars and grunts, so that the entire area, occupied by a breeding herd. is in a constant state of uproar day and night; when it is considered that a thousand seals or so may be collected on a stretch of beach half a mile long, the noise may be better imagined than described.

FIG. 4.—CAPE DOLPHIN, EAST FALKLAND.

Part of a rookery towards the end of the breeding season, showing sea-lions near the water's edge. The adult male in the foreground shows the thinness characteristic of the end of the breeding season.

The pups are born in the southern summer, from about the end of December to the end of January, and from a very early age are tolerably active little creatures. Since the mothers spend a good deal of their time feeding at sea, the young exhibit their gregarious nature by herding together in what are technically termed "pods," which may number several score towards the end of the season. They spend their time sleeping and playing about, either with one another, when, as might be expected, the play takes the form of mock fighting, or in solitary games with pieces of stick or seaweed found on the beach. They soon find their way to the water's edge and pools left by the tide, and there

the games vary, being in the nature of aquatic gymnastics, as a result of which they learn the rudiments of swimming, but they do not venture into deep water, contenting themselves with places where they can see the bottom with ease. The cows find it necessary to teach the pups to dive; one can observe a cow inveigling her pup away from the water's edge into the deeper part, and the pup swimming like a dog after her, its head well up and the little flippers going hard. When the two arrive at a suitable place, the cow begins to play with the pup and en-

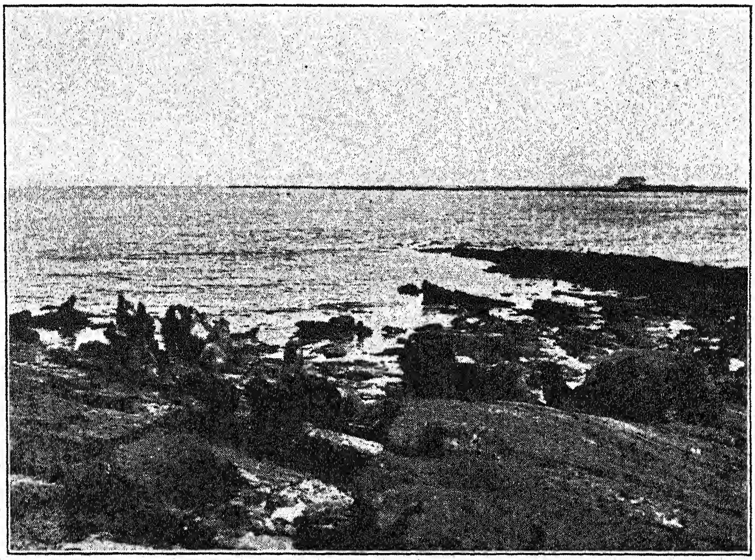


Fig. 5.—Low Island, West Falkland.

At the end of the breeding season all the animals are willing to enter the water. In the picture there is a small pod of pups in the foreground, and behind them an adult male which is beginning to go down to the water.

courages it to play with her, swimming round and round, and making shallow dives in the endeavour to persuade the pup to follow. Often the pup tires or gets frightened, and tries to climb on to his mother's back, but she slips away from underneath and leaves him to support himself: the truth is that the agility and elegance which distinguish the movements of the sea-lion in the water are learned only by continual practice, while the ability to swim downwards—that is, to dive—is acquired only with some difficulty. This lack of an inherent power to swim well affords a contrast between the sea-lion and such a representative of the True (earless) Seals as the Elephant Seal, a species in which the cow leaves her pup after a very short time and it has to swim

without the least help from the start. It may be opportune to remind the reader that the True Seal has gone much farther from the life of the four-footed animal than the Eared Seal, which can still use all its four feet to stand upon and, when ashore, can walk on them like any terrestrial animal. The True Seal, of course, is unable to stand on its feet, and crawls on the ground like a slug.

The cow suckles the pup for a period of uncertain length, which may even extend to the subsequent breeding season, nearly a year, but at the end of five months the pup is already beginning to eat solid food, the taste for which it acquires, I

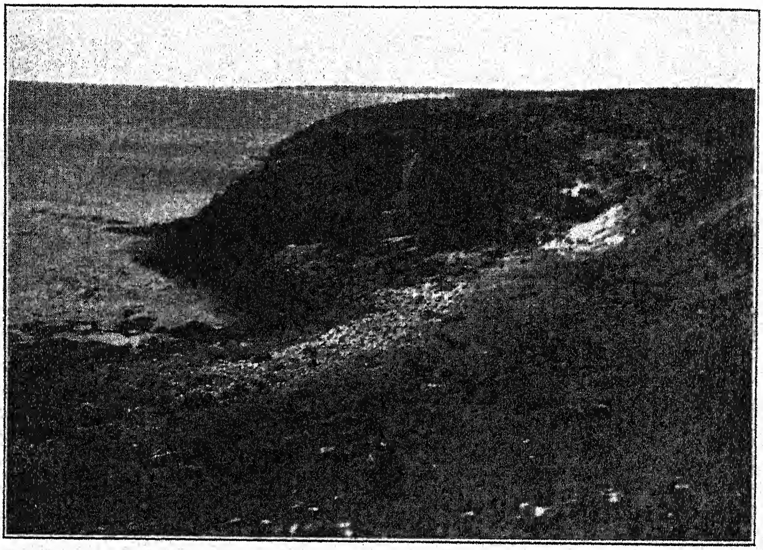


Fig. 6.—Cape Dolphin, East Falkland.
Spare males on a pebble beach.

believe, as the result of its habit of playing with loose objects on the beach or in the water. It is certain that the stomach contents of the pups are such as would result from this method, as they comprise such things as bottom-living crustacea and ascidians, which do not form part of the food of the older sea-lions, as well as the remains of *Munida*, which is an important foodstuff at all later stages in the life of the animals. When the next pup is born, the older one usually leaves the mother—but not, I am inclined to think, invariably—and joins the general crowd of immature seal.

I have spoken of the breeding herd, but not yet of the non-breeding herd. On some part of the beach usually somewhat separated from the breeding seal are the haunts of the non-breed-

ing seal, and there are found also many of the spare bulls, which seem to have given up all hope of securing cows, for the time being at any rate. The sea-lion takes about six years to arrive at its adult state, so that the non-breeding herd consists of a very varied assortment of animals, males and females of different ages, and except in the later stages very much alike in appearance, but the females are on the whole rather slighter than the males, and are more likely to have pale markings about the head. These non-breeders are much more easily stampeded than the

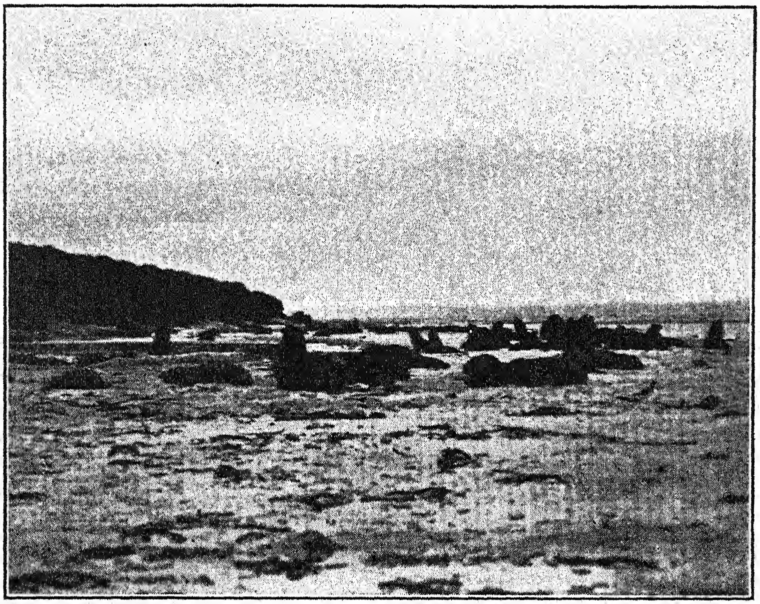


FIG. 7.—ELEPHANT CAYS, EAST FALKLAND.
Spare males on the sandy beach of an island covered with tussock grass.

breeding cows, and an incautious movement on the part of the observer will send a herd of hundreds galloping down to the sea amid a chorus of cries, and, if the ground be clayey, in the midst of a thick cloud of dust. On arriving at the water, the animals charge into it and swim out some distance before they look round to see what frightened the individual which gave the alarm. This is always the way: the panic of one seal will affect the whole crowd. The appearance of a strange object on the water may have a very different effect. On the arrival of a boat at places where lions have not been molested, I have seen them come down from the shore in numbers, and the boat was soon surrounded by a crowd of inquisitive, gambolling animals, playing round and

under it, and poking their heads above the water to have a good stare and sniff at the strange object.

The sea-lion seems to have almost no natural enemies. That terror of the Bering Sea, where it destroys many fur-seals, the Killer Whale, is very rare round the Falklands, and the Leopard Seal, which will on occasions eat pups and perhaps older sea-lions, is definitely scarce in the islands, which are in actual fact too far north to be much frequented by the species. A strongylid worm is perhaps the most deadly foe, since it is

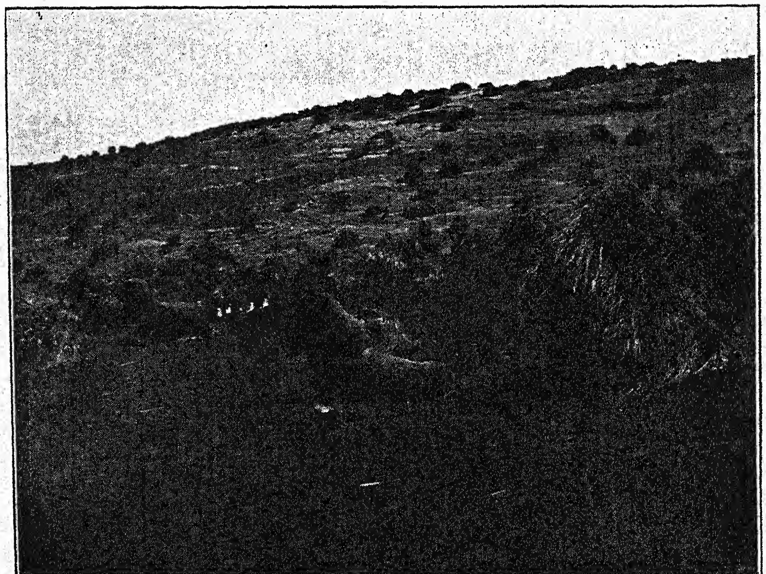


Fig. 8.—Cape Meredith, West Falkland.

The ground was formerly covered with tussock grass, but except for the large tufts has been denuded of it by the sea-lions.

probably the cause of death in a considerable number of pups, but starvation due to the mothers losing them may well be a more important factor. But if nature has not provided a means of keeping the numbers down, man has done his best. For many years the Falklands were frequented by sealers and whalers of the old style, whose one object was to fill the ships, and thus fur-seals were almost exterminated and the oil-producing animals, elephant-seals and sea-lions, suffered greatly, the former being reduced to such a degree that the occurrence of an elephant-seal was something to remark. Of late, I am glad to say, this species has increased in number; it might be suggested that this is the result of the increase of the numbers in South Georgia, but of this

there can be no certainty at present. The sea-lion was never brought so low as the other two species named, and although local sealing business was carried on in a small way for many years after sealing and whaling voyages stopped, that also ceased some considerable time ago.

It is still possible here and there to find places and numbers of bones where the sealers put up their try pots, and I have even found one of the lances with which they killed the seals. This consisted of an iron shaft about 30 inches long, with a flat blade about 4 inches long by $2\frac{1}{2}$ inches wide. I must say that I admire

FIG. 9.—CAPE MEREDITH, WEST FALKLAND.
Sea-lions in the water, as seen commonly all the year round.

the courage of the men who would walk up to a bull seal and attack him with such a weapon; it should be remembered that the sea-lion is capable of exceedingly quick movements and is a creature of immense strength. I have seen a bull lift a full-grown cow in his jaws in spite of her struggles and bites, and the cow probably weighed three or four hundred pounds.

Of late years some attempt has been made to develop a sea-lion oil industry, but among other factors the low price of oil has done much to prevent success; this new sealing confined its killing of sea-lions to the bulls, of which, as can readily be appreciated, there is a vast excess, due to the equality of the birth-rate of the sexes and the polygamy of the males. The

killing of superfluous bulls would undoubtedly benefit the herd, and should actually encourage its increase by reducing the disturbances in the breeding rookeries, which must result in the deaths of numbers of pups due to their being trampled down, while the pestering of the spare bulls may prevent cows from returning to the places where they left their pups.

It may be opportune to state that this imposing species occurs in the Falklands in very large numbers, and is most strictly protected by the Colonial Government, all killing being done under licence and with the proviso that a detailed report of the killings be made. Under the present conditions the herd must inevitably increase until it reaches the saturation point for the Falkland Islands, which point is still so far off as to require no consideration at present.

A NEW EXHIBIT OF IGUANODON.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

Any new exhibit of one of the larger fossil vertebrates must be of interest, partly on account of the rarity of such remains, especially in anything approaching a complete state, and partly because of the long process of development and the methods of preservation and mounting which are involved in its display. On these grounds the mounted skeleton of *Iguanodon* (Fig. 1), which has just been placed on exhibition in the Dinosaur Gallery of the Museum, merits at least a short note.

In 1914, the nearly entire skeleton of a large fossil reptile was discovered in the Wealden Shales, after a fall of cliff near Atherfield, in Brightstone Bay, on the south-west coast of the Isle of Wight. Owing to the condition of the skull bones it was recognized as a young individual, and preliminary investigation quite naturally suggested that it belonged to the species *Iguanodon bernissartensis*, so well known as a result of the discovery, in 1878, of the remains of numerous individuals at Bernissart, near Mons, in Belgium. The finder of the fossilized skeleton was Mr. Reginald W. Hooley, a Winchester business man, who was an assiduous and careful collector of fossils, and an excellent example of the type of amateur geologist and

palæontologist who has done so much for science in this country. The skeleton was developed with great skill from the matrix by Mr. Hooley himself, and his discovery of it and of the remains of integument preserved upon it was published in the *Geological Magazine* for April 1917. For some years he continued the slow and laborious task of developing the bones out of the matrix, studying and describing them, and his important studies were completed in 1924 just before he died as the result of a surgical

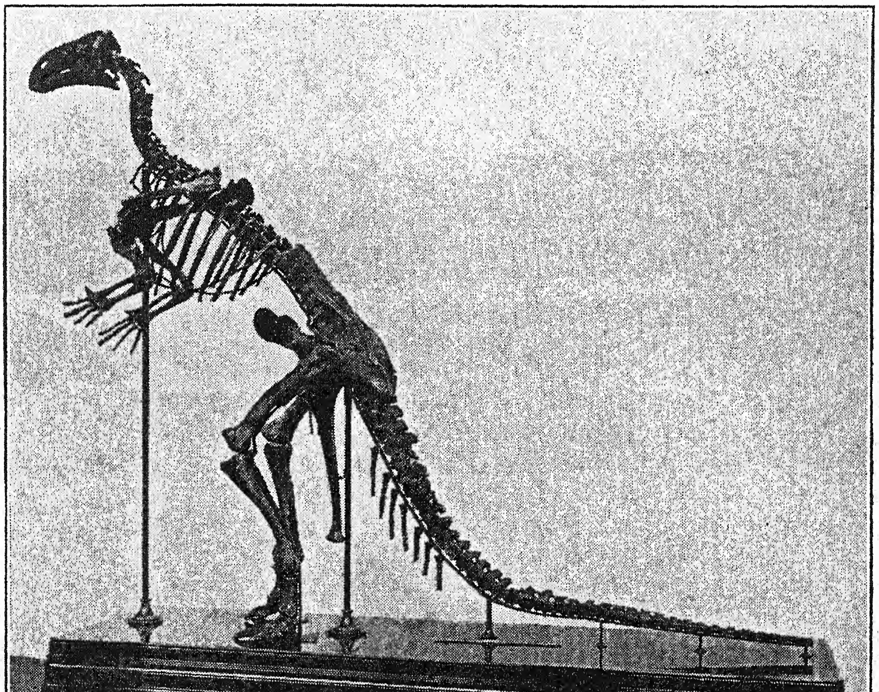


FIG. 1.—MOUNTED SKELETON OF *Iguanodon*.

operation. His paper, however, was read before the Geological Society, and published in 1925.*

This paper gives such an adequate and detailed account of the whole specimen that any further description is unnecessary. Mr. Hooley's examination proved that the skeleton could not be assigned to the species *Iguanodon bernissartensis*, as he had previously assumed, nor, indeed, to any other described by that time, and so it was made the type of a new species, named after its place of origin, *Iguanodon atherfieldensis*. In the characters

* *Quarterly Journal of the Geological Society*, 1925, vol. lxxxi, pt. i, pp. 1–61.

of the skull and other parts of the skeleton this species is intermediate between *Iguanodon bernissartensis* and *Iguanodon mantelli*, both of which are found in the Wealden of Dorset, Sussex, and the Isle of Wight. In 1924 Mr. Hooley's collections were purchased by the Trustees of the British Museum, but, as the preparators were for some years fully occupied in the workshops, it was only recently that the business of mounting the specimen was begun. The bones were first of all sorted out according to Hooley's description, and those that required further cleaning or repair were attended to. In some cases missing parts were modelled in plaster, and the last vertebræ of the tail were all prepared in this way, but it should be emphasized that the amount of plaster work is relatively small and each part of it was modelled upon some similar bone in the skeleton. The important but laborious process of mounting the bones for exhibition presented some difficulty. The bones are heavy; for example, the three-feet-long thigh-bones each weigh $37\frac{1}{2}$ lb., so that obviously a structure of some stability had to be erected for their support; further, such an iron mount must be shaped to fit the bones if it is to give adequate support and be as unobtrusive as possible. The iron-work was entrusted to the Museum smith, but so frequent were the calls upon his services from other quarters that it was unfair to expect continuous service on his part. Fortunately, Dr. C. T. Trechmann came to hear of the difficulty and generously provided the funds for the temporary employment of a smith. The work was then able to proceed without interruption. The bone and plaster additions were then mounted to the iron-work in such a way that every important member of the skeleton is readily detachable for study. As the skeleton is not under glass-protection, the hardening of the bones was important, and a solution of amber shellac was applied until the whole is now adequately protected. The plaster-work was painted in colour approximating to that of the bones, but the distinction is readily apparent. The work of repairing, modelling, preserving, and mounting was done with great skill by Mr. L. E. Parsons, Technical Assistant in the Department of Geology, and the resulting exhibit is very effective.

The length of the skeleton from the tip of the snout to the tip of the tail is 16 feet, which may be compared with the 34 feet of some of the large Iguanodons.

In life these creatures were herbivorous, feeding upon the trees and shrubs of the early Cretaceous period, and no doubt digging off branches or fronds with their spike-like thumbs. As most browsing types of animals living to-day avoid the kinds

of plants most akin to those of the Wealden flora, it is difficult to know what particular plants the Iguanodons would eat. The teeth are well adapted for a browsing habit; in the front of the jaws, however, there are no teeth, but instead a horny beak.

Iguanodon was bipedal, though probably it occasionally rested upon all-fours. It may have been a moderately swift runner when pursued, as it must have been by the contemporary preying dinosaurs. The skin was unarmoured, and this particular specimen has traces of it remaining which are instructive. It is remarkable for its thinness and its covering of small tubercles, a condition which was continued even on the skin between the fingers. In addition to these small tubercles various parts of the body integument were ornamented by groups of polygonal plates, of about one inch in diameter. Nothing, of course, is known about the colour of the skin.

The exhibit should prove attractive to the public; not only because it is an unusually fine skeleton and well mounted, but also because of its English, and almost local, origin.

BRITISH FRESHWATER INSECTS SCENE.

By D. E. Kimmins, Unofficial Scientific Worker, Department of Entomology.

A scene (Fig. 1) illustrating British Freshwater Insects has recently been installed in the Insect Gallery. The scene is a country district in the Midlands during the month of June, and in the foreground is a corner of a pond, around the margin of which are a few characteristic plants such as yellow iris, sedge, forget-me-nots, and rushes. In the middle distance can be seen a slowly-flowing river, bordered by yellow iris and purple loosestrife. The exhibit itself is divided into two parts at the level of the water, so that the visitor can view the general scene and then study the life in the pond.

In the upper part of the case are dragon-flies (*Odonata*) in flight and at rest, caddis-flies (*Trichoptera*), pond skaters (*Hemiptera*), flies (*Diptera*), and beetles (*Coleoptera*). The dragon-flies include examples of the big *Anax imperator*, flying high over the pond, male and female of the broad-bodied Libellula (*Libellula depressa*), the two common blue damsel-flies (*Agrion puella*), and *Ischnura elegans*, and also the scarlet *Pyrrhosoma nymphula*. A female of the latter species is shown ovipositing on a potamogeton leaf, whilst the male remains in attendance, clasping the prothorax of the female with his anal appendages, and balancing himself vertically over the female. Fluttering over the margin on the right are examples of *Calopteryx splendens*, the nymphs of which occur in slowly running water. Cast nymphal skins of dragon-flies are shown on the rushes and on the leaves of the yellow iris.

Settled on the stems of the rushes and of the yellow iris are caddis-flies of

various species, including *Phryganea grandis*, *Limnophilus flavicornis*, and *Limnophilus sparsus*. On a leaf of potamogeton are two examples of one of the

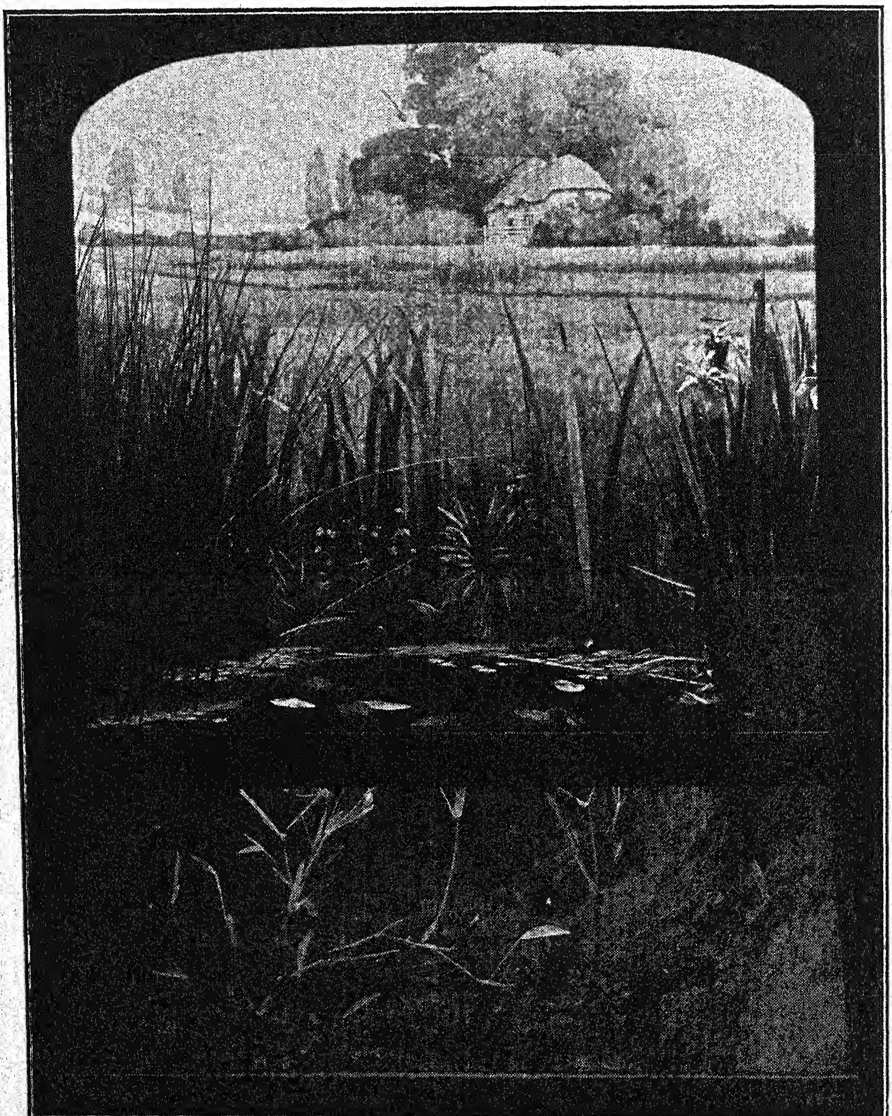


FIG. 1.—BRITISH FRESHWATER INSECTS SCENE.
View above and below the surface of the water.

long-horned caddis-flies, *Mystacides azurea*. The pond skaters on the surface of the water are represented by two species of *Gerris*, and on a floating leaf to the left are specimens of the very delicate little bug *Hydrometra stagnorum*.

Among the flies shown are hover-flies of the genera *Myiatropa* and *Helophilus*, a large daddy-long-legs with patterned wings, the larva of which lives in damp soil, a large yellow and black fly, *Stratiomys*, both larva and pupa of which are aquatic, and also the Midge, *Chironomus plumosus*.

In the under-water portion are, besides a number of plants of a potamogeton (*Potamogeton natans*), specimens of the great water beetle, *Dytiscus marginalis*, and its larva; the water boatman, *Notonecta glauca*, a water-bug which always swims on its back and carries a silvery film of air on its ventral surface; both these insects are carnivorous. Other representatives of the water-bugs include the water scorpion, *Nepa cinerea*, which hides in the mud, awaiting its prey, and *Ranatra linearis*, which hangs head downwards from the aquatic vegetation and catches insects with its mantid-like front legs. Two types of dragon-fly nymphs are shown: the elongate form, which occurs in the genera *Anax* and *Aeschna*, and the shorter, more sprawling form of the genus *Libellula*. The latter frequent the fine mud at the bottom of ponds, which adheres to the hairs that clothe them and renders them almost invisible. Both types are carnivorous and catch their prey by means of a folded, extensible "mask," which is developed on the under side of the head and is capable of being shot out when the insect is within reach of its prey. Cases of a number of different Caddis larvæ are exhibited, including the cylindrical, spirally built leaf cases of *Phryganea* and the flat leaf cases of *Glyphotælius*.

Mr. Ernest Whatley is the artist who painted and prepared the scene.

BOOK NOTICES.

What Butterfly is that? A Guide to the Butterflies of Australia. By G. A. Waterhouse, D.Sc., F.E.S. Pp. viii + 292; 34 plates, 26 in colour. (Sydney: Angus and Robertson, 1933. 12*s.* 6*d.*)

The first twenty-three pages of this admirable book deal with general matters, classification, development, variation, distribution, etc., and the last twenty-seven contain the index and many hints on collecting. Amongst the latter there is, rather oddly placed there, a brief account (p. 269) of the relationship of the butterfly fauna to the main vegetational zones, showing how practically all the endemic species are restricted to the Sclerophyll forests along the coasts of New South Wales and Victoria. The remainder of the book is devoted to a very methodical systematic account of the butterflies, the brief description being accompanied by the known distribution and such information as is available concerning the immature stages, food-plants, etc. It is in this last category that the most noticeable advance has been made since the publication, jointly with Lyell, of Dr. Waterhouse's "Butterflies of Australia" in 1914. Indeed, although the author bemoans the numerous lacunæ, the fullness of the data on this subject is quite surprising; it is high testimony to his persistence and devotion to his subject. As already stated, the descriptions of the butterflies are brief, but, when the excellence of the coloured plates by Neville Cayley is taken into consideration, it cannot be said that they are inadequate. To many students the provision of keys for the recognition of species would have been welcome, but in a work, the appeal of which is largely popular, their absence is readily excusable. Even without a check of this kind it may confidently be said that Dr. Waterhouse will certainly achieve his main object, namely, "to

enable anyone to identify readily any butterfly he is likely to see in the settled parts of Australia." The provision of popular names for the 339 species described might be deprecated by some; but, since these would inevitably be coined eventually, it is perhaps as well that it has been done at once and by a single author. The plan adopted by Brigadier Evans for the Indian butterflies has been followed, and, if it has resulted in a Tindale's Jezebel, and a Tailed Cupid, what does it matter? Of a book so concise, so up-to-date, so sound yet popular, so admirably illustrated and produced, in a sense so final in respect of its main subject, such criticisms as may be made are but trivialities.

Australian Finches in Bush and Aviary. By NEVILLE W. CAYLEY. Pp. xix + 256, with 10 plates in colour and 16 in monochrome. (Sydney: Angus and Robertson, Ltd. 1932. 12*s.* 6*d.*)

LAST year Mr. Cayley produced a very useful general book on the birds of Australia, but in the present volume he has confined himself to one particular family: the Weavers or Weaver Finches. This family is represented in Australia by nineteen species and a number of races.

Each bird is fully described and the characters by which the races can be distinguished are also given, while their distribution is shown on a series of maps. A knowledge of these subspecies is an important detail to the aviculturist, since, as the author tells us, certain races are easily kept in captivity and others are not. For instance, the form of the fire-tailed finch in Tasmania is, in a wild state, a tamer and more confiding bird than its cousin across the Bass Strait, and in captivity birds from the mainland generally die soon after capture, while those from the island live a good time. There are useful hints on construction of aviaries, and the care of different species and their ailments. A paragraph is devoted to the historical details of the discovery of the different birds most of which were originally discovered or described by Gould.

Mr. E. W. Jones contributes a chapter entitled "Among the Finches in their Natural Haunts," and has much interesting information to tell. He describes how the birds are captured by professional trappers and sent to the towns for sale. Once when motoring along a travelling stock road during great heat he noticed swarms of Weaver Finches trying to drink from cattle troughs at the roadside. The troughs were only half full and in their attempts to get at the water numbers of the birds fell in and were drowned. Mr. Jones placed pieces of wood in the troughs to help the birds but was taken to task by a stockman, who said the cattle might be frightened and that the water was for them and not for the birds.

This will be a useful book for the aviculturists and the admirable coloured drawings of the various species and subspecies will greatly facilitate identification. In addition, there are two plates depicting a number of hybrids.

Deuxième Congrès International pour la Protection de la Nature (*Paris,* 30 *juin*–4 *juillet* 1931). *Procès-Verbaux, Rapports et Voeux, publiés sous la direction de A. Gruvel par Charles Valois et G. Petit.* Pp. iv + 584, with 16 plates. (Paris: Société d'Éditions Géographiques, Maritimes et Coloniales. 1932.)

THIS large volume includes in full the communications made to the Second International Congress for the Protection of Nature, and also the principal speeches made at the plenary sessions. This Congress, like the First, held in 1923, took place in Paris, the venue being certain of the lecture theatres attached to the Natural History Museum. The Congress was divided into the five sections: Faune, Flore, Sol et sous-sol, Sites et Paysages, Protection générale de la Nature. Such a division was perhaps unfortunate as the several meetings

were held simultaneously and delegates were necessarily often absent from discussions in which they might have been interested. The President of the Congress was Monsieur Albert Lebrun, then President of the Senate, who was subsequently elected President of the French Republic.

The various communications convey much interesting and useful information about what has been or should be done towards the protection of nature in various parts of the world; but it is far from complete or comprehensive. For instance, the position in Great Britain is not mentioned and little generally is said about conditions in the British Empire, only two such papers being presented : the one by Capt. Keith Caldwell on hunting the elephant and rhinoceros in Uganda and the other by Major R. W. G. Hingston on the African elephant and the traffic in ivory.

The principal, and possibly the only practical achievement of the Congress is the resolution in favour of a conference of the Powers interested to discuss the adoption of a convention based on the London one of 1900 for the protection of the African fauna (p. 543). This resolution arose immediately out of the letter from the British Prime Minister (p. 41), which the British Government delegates laid before the Congress.

MUSEUM NEWS.

His Royal Highness Prince George, K.G., accompanied by Major Humphrey Butler, M.C., visited the Museum on March 9.

Their Royal Highnesses the Duke and Duchess of York visited the Museum on March 27.

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The Principal Trustees have appointed Mr. F. C. Fraser and Mr. J. F. Perkins Assistant Keepers in the Departments of Zoology and Entomology respectively.

Mr. Francis Charles Fraser was educated at Dingwall Academy and at Glasgow University, where he graduated B.Sc. with second-class honours in zoology in 1924. He served as biologist with the "Discovery" Committee from 1925 until his appointment to the Museum.

Mr. John Frederick Perkins was educated at Newton College and at the Imperial College of Science, where he obtained first-class honours in the final examination in 1932.

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The Exhibition of the Game Animals of the Empire, which was opened in the new Whale Gallery on May 31 last and proved such a popular attraction, was closed on March 19. A brief description of it by its organizer, Capt. J. G. Dollman, appeared in the *Natural History Magazine*, 1932, vol. iii, pp. 239–42. The illustrated guide-book, "Game Animals of the Empire," by the same writer is still available, price sixpence.

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A scene, illustrating the life-history of British Freshwater Insects, has been installed in the Insect Gallery.

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A new unified scheme of warding, including the fire protection, came into operation on April 1. The services of police and police pensioners have been

dispensed with, and all the warders are now directly employed by the Trustees. Simultaneously, the titles of the Hall Staff have been changed to Superintendent, Deputy Superintendent, and Assistant Superintendents, as they have been placed in charge of the warders.

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The series of Special Lectures on Monday mornings will be suspended during July, August, and September, and will be resumed on October 2.

ACQUISITIONS.

Department of Zoology.

A collection, of over 2500 birds and 100 mammals, made by Mr. Jack Vincent in Portuguese East Africa; presented by Rear-Admiral Hubert Lynes, C.B.

Mounted specimens of an Eritrean kudu from north-east Africa, an ocelot from South America, and a pigmy marmoset; presented by the Rowland Ward Trustees.

A collection of mammals from India; presented by Lieut.-Col. C. H. Stockley.

Skull of a bongo, with exceptionally long horns, from Ashanti; presented by Mr. Reginald C. Graves.

Skin and skull of a hybrid between a lion and a leopard, which was bred in the Gardens of Kolhapur; presented by Col. F. W. Wodehouse, C.I.E.

Skull of a lion, a man-eater which in the years 1925 and 1926 killed fifty natives from villages near the junctions of the Bua and Ruca rivers in Nyasaland; presented by Mr. R. H. Keppel-Compton.

A small collection of mammals, including a new species of golden mole belonging to the genus *Chlorotalpa*, from Tanganyika Territory; presented by Mr. W. G. Cubitt-Currie.

Collections of big game trophies; presented by Lady Wolverton, Col. J. L. F. Tweedie, D.S.O., and Major L. Payne-Gallwey.

A topi from Kenya Colony; presented by Lord Howard de Walden.

Two mounted heads of the East African buffalo; presented by Hon. John Scott-Ellis.

Skin and part of the skeleton of a manatee from Nigeria; presented by Mr. F. J. Woods.

Skins of a male and female golden cat, *Profelis aurata*, from the Cameroons; presented by Mr. F. Carpenter.

A collection of shells of land snails of the genus *Clausilia* and of the dog whelk (*Thais lapillus*); presented by the Rev. A. H. Cooke, D.D.

A St. Bernard dog; presented by Mrs. Staines, who is defraying the cost of mounting the specimen.

Welsh terrier specimen; presented by Mr. Walter S. Glynn.

A mounted specimen of a bull terrier; presented by Mrs. Snell.

Fur-seal skin, prepared to show the difference between natural, prepared, and dyed fur; presented by the Hudson's Bay Company.

Coypu or Nutria skin, prepared to show the natural fur on one half and on the other half the prepared nutria fur; presented by Messrs. P. R. Poland & Sons.

Statuette of a horse, representing the best type of hunter, the work of the donor; presented by Capt. Adrian Jones.

A valuable series of shells of the genus *Partula* illustrating the remarkable local polymorphism manifested by these land snails; received in exchange from the Museum of Comparative Zoology, Cambridge.

A specimen of the giant squid, *Architeuthis*, stranded in West Bay, Scarborough, on January 14; purchased.

Department of Entomology.

About 2500 insects of various orders collected in Perthshire by members of the staff of the Department of Entomology; presented by the Trustees of the Godman Exploration Fund.

Final instalment of the material collected by the Percy Sladen Trust Expedition to the Seychelles and other islands of the western Indian Ocean in 1905 and 1908–9; presented by the Percy Sladen Trustees.

A further selection, numbering 7773 insects, from South Africa during the past year; collected and presented by Mr. Rowland Turner.

A small collection of Caddis-flies formed at Burnt Woods, Staffordshire, by the donor; presented by Mr. H. W. Daltry.

A series of a new species of *Blepharocera*, from Mount Kina Balu, North Borneo; presented by Mr. H. M. Pendlebury.

Department of Geology.

Model of an extinct straight-tusked elephant; presented by the American Museum of Natural History, New York.

A collection of ammonites from the Bathonian beds of Antarctic Harbour, East Greenland; obtained by the expedition in 1929 under the leadership of Mr. J. M. Wordie.

A complete specimen of the ancient shark, *Hybodus hauffianus*, 7 feet long, from the Upper Lias of Holzmaden, Württemberg; purchased.

A small number of very fine fossil fishes from the Eocene beds of Monte Bolca, north Italy; purchased.

Department of Mineralogy.

A large and finely marked mass of meteoric iron, weighing 170½ lb. (77½ kg.), from the meteorite craters near Henbury, Central Australia; presented by the Kyancutta Museum, South Australia, through the Secretary, Mr. R. Bedford.

Fractured and powdered dolomite rocks from the meteorite craters of Kaali, on the island of Oesel in Estonia; presented by Mr. J. A. Reinvaldt.

A very large mass of celestine, weighing 8¼ cwt. (423 kg.), from Yate, Gloucestershire; presented by the Bristol Land & Mineral Company.

Bauxite from south France; presented by the Directors of the Union des Bauxites.

A specimen of minyulite, a new phosphate mineral, from Western Australia; presented by Dr. Edward S. Simpson.

Kolbeckine, a new mineral, from Bolivia; presented by Dr. R. Herzenberg.

Manuscripts from the collection of the Edinburgh banker and mineralogist, Thomas Allan (1777–1833); presented by Lieut.-Col. P. S. Allan, D.S.O.

Fragment of a meteoric stone, of the rare eucrite type, which fell near Chaves, Portugal, on May 3, 1925; exchanged.

Fragments of a meteoric stone, which fell near Yukan in eastern Kiangsi, China, on August 27, 1931; exchanged.

A series of tektites from French Indo-China and Tan-Hai, south China; exchanged.

New mineral species: ardealite, from Transylvania; bianchite, from Italy; cer-orthite, from Finland; purchased.

A cabochon-cut white scapolite, weighing 33½ carats, from the Ruby Mines, Upper Burma; purchased.

Department of Botany.

A further consignment of Nepal plants, which were collected in central Nepal by Prof. K. N. Sharma and presented to the King by His Highness the Maharaja of Nepal; loaned by His Majesty the King.

Herbarium of the donor's late husband, Mr. Percy Moring; presented by Mrs. Moring.

OBITUARY.

MR. B. H. SOULSBY, M.A.

Mr. Basil Harrington Soulsby died at his residence at Reading on January 14 after a short illness in his sixty-ninth year. He retired from the Office of Librarian on January 23, 1930, and an account of his career appeared in the *Natural History Magazine* (1930, vol. ii, p. 176, portrait p. 175). After his retirement he continued to give voluntary help with the preparation of the catalogue of the works of Linnæus, on which he had been engaged for some years, and, indeed, he visited the Museum shortly before Christmas. During his life he was a generous donor to the Museum Library, and at his death bequeathed to it all the Linnean material in his possession. The funeral service at All Saints Church, Reading, on January 17 was attended by Mr. A. C. Townsend, his successor as Librarian, and by Dr. W. T. Calman, Dr. W. E. Swinton, Mr. T. Wooddisse, and Dr. G. F. Herbert Smith, of the Museum Staff.

LIEUT.-COL. J. STEPHENSON, C.I.E., F.R.S.

The death of Col. J. Stephenson on February 3, almost on the eve of his sixty-second birthday, has deprived the Trustees of the services of one of the band of workers which the Museum has long been fortunate enough to attract to till the field of natural history, ever too large to be cultivated thoroughly by the permanent staff. He had under his care the little-studied group of earthworms and allied creatures. Unhappily the Museum had the benefit of his help for little more than three years.

Born on February 6, 1871, Col. Stephenson was educated at Burnley Grammar School and at Manchester University. In 1895 he entered the Indian Medical Service, and in 1906 was appointed Professor of Biology at Government College, Lahore, and of Zoology there in 1912, becoming Principal the same year; in 1918 he was Vice-Chancellor of Punjab University. On returning home, he was Lecturer in Zoology at Edinburgh University from 1920 to 1929, when he came up to London to be Editor of the "Fauna of British India" and at the same time to work at the Museum. He was elected a Fellow of the Royal Society in 1930. At the time of his death he was Zoological Secretary of the Linnean Society.

At the funeral at Kensal Green Cemetery on February 6 the Museum was represented by Dr. W. T. Calman, Mr. J. Ramsbottom, Mr. G. C. Robson, Mr. N. B. Kinnear, Mr. C. C. A. Monro, and Dr. G. F. Herbert Smith.

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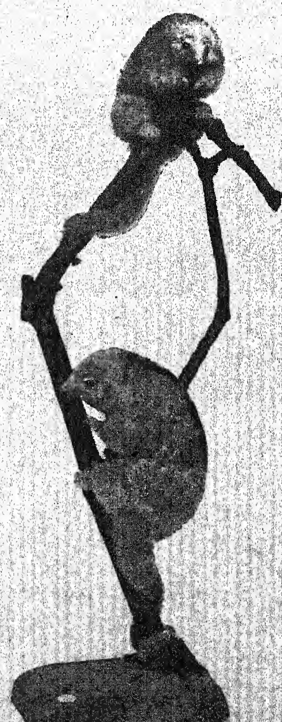

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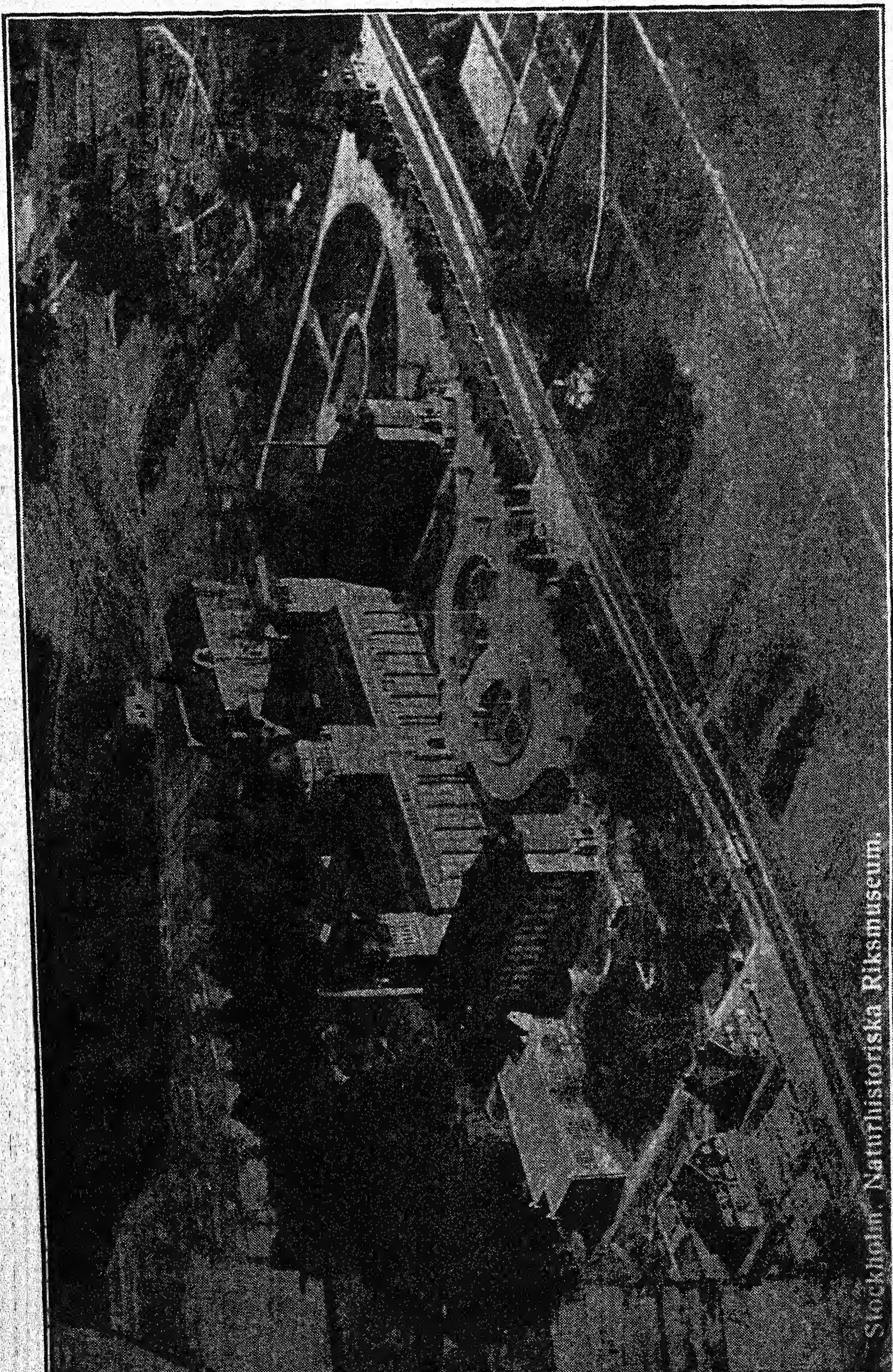
THE NATURAL HISTORY MUSEUM (NATURHISTORISKA RIKSMUSEUM) STOCKHOLM.

By Prof. Dr. Einar Lönnberg, formerly Intendant of Vertebrates, Natural History Museum, Stockholm.

At the first meeting of the Swedish Academy of Science, on June 2, 1739, it was resolved to buy a cabinet for keeping natural history specimens; such may be said to have been the origin of the Natural History Museum at Stockholm. The first specimen received was a sponge which had been found growing on a ship, and other gifts in the first year included shells, eggs of a ray, and archaeological specimens, thus indicating the future range of the Museum or, as it was first called, the Natural History Cabinet of the Academy. At the beginning growth was slow; the additions were mainly single specimens, some merely "curiosities" as they were called at that date, but they did include some collections, either given or purchased. The old records mention collections of minerals, of insects, and of vertebrates, and herbaria. Students of Linnaeus who had travelled abroad brought back home with them natural history specimens from different parts of the world: for instance, Kalm from North America, Rolander from Surinam, and Sparrman from South Africa. The last named was employed from 1777 to 1798 as curator or demonstrator of the collections, which were exhibited in a building bought by the Academy in 1778, and at least from 1784 were open to public inspection. Considering the smallness of the funds available, the growth of the collections was quite satisfactory. As arsenical soap for preserving certain specimens—for instance, mounted birds and mammals—against the ravages of moth, was unknown at that time, many of them fell to pieces. The only method then in use was to keep the specimen in a wooden case with a glazed front. In this way many of the type specimens of "Museum Carlsonianum," which had been described by Sparrman, were eventually lost. Despite such losses the collections continued to grow, and in 1818 the Academy found it necessary to appoint

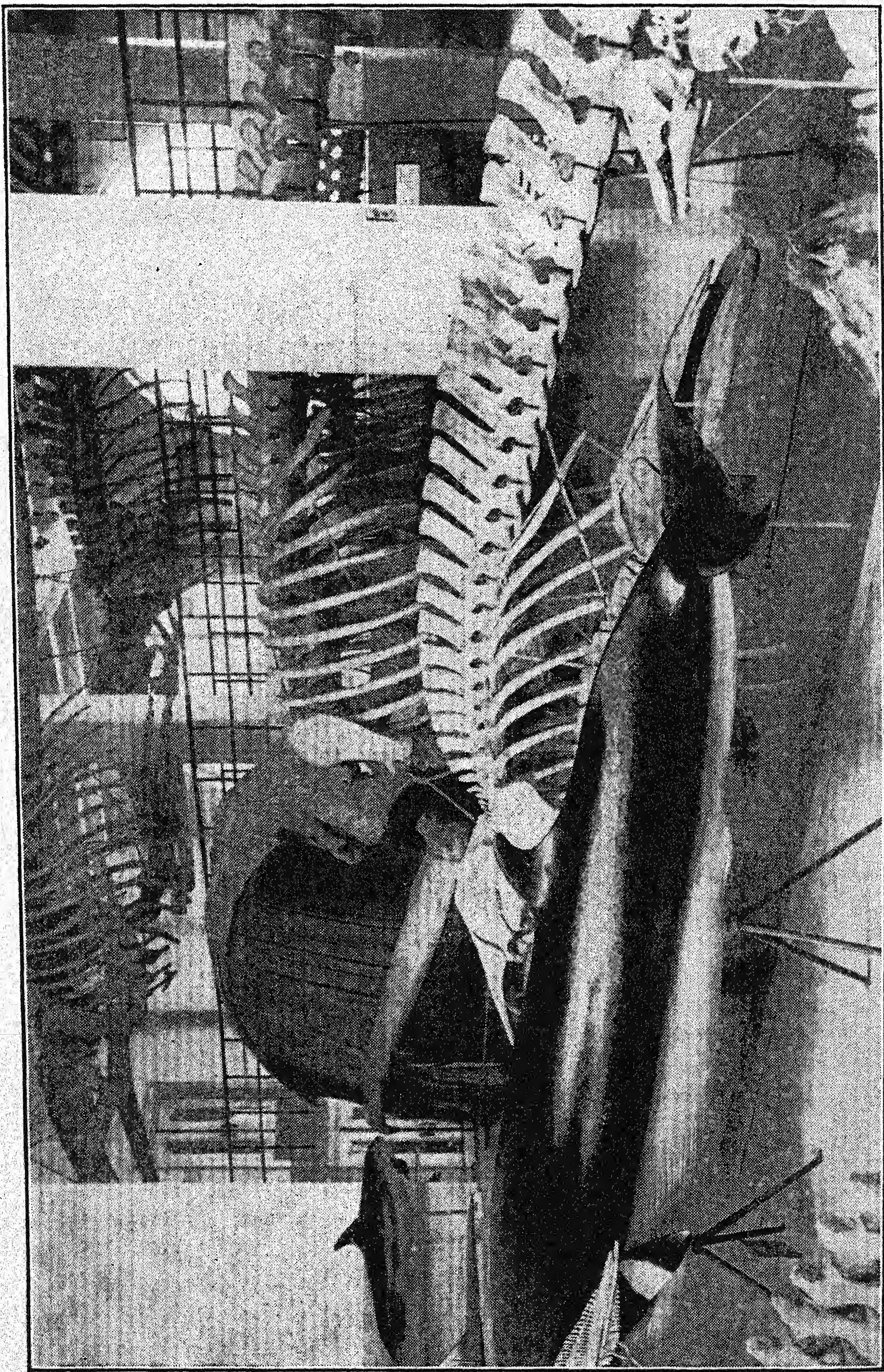


THE NATURAL HISTORY MUSEUM, STOCKHOLM.
View from the air, looking south-east.

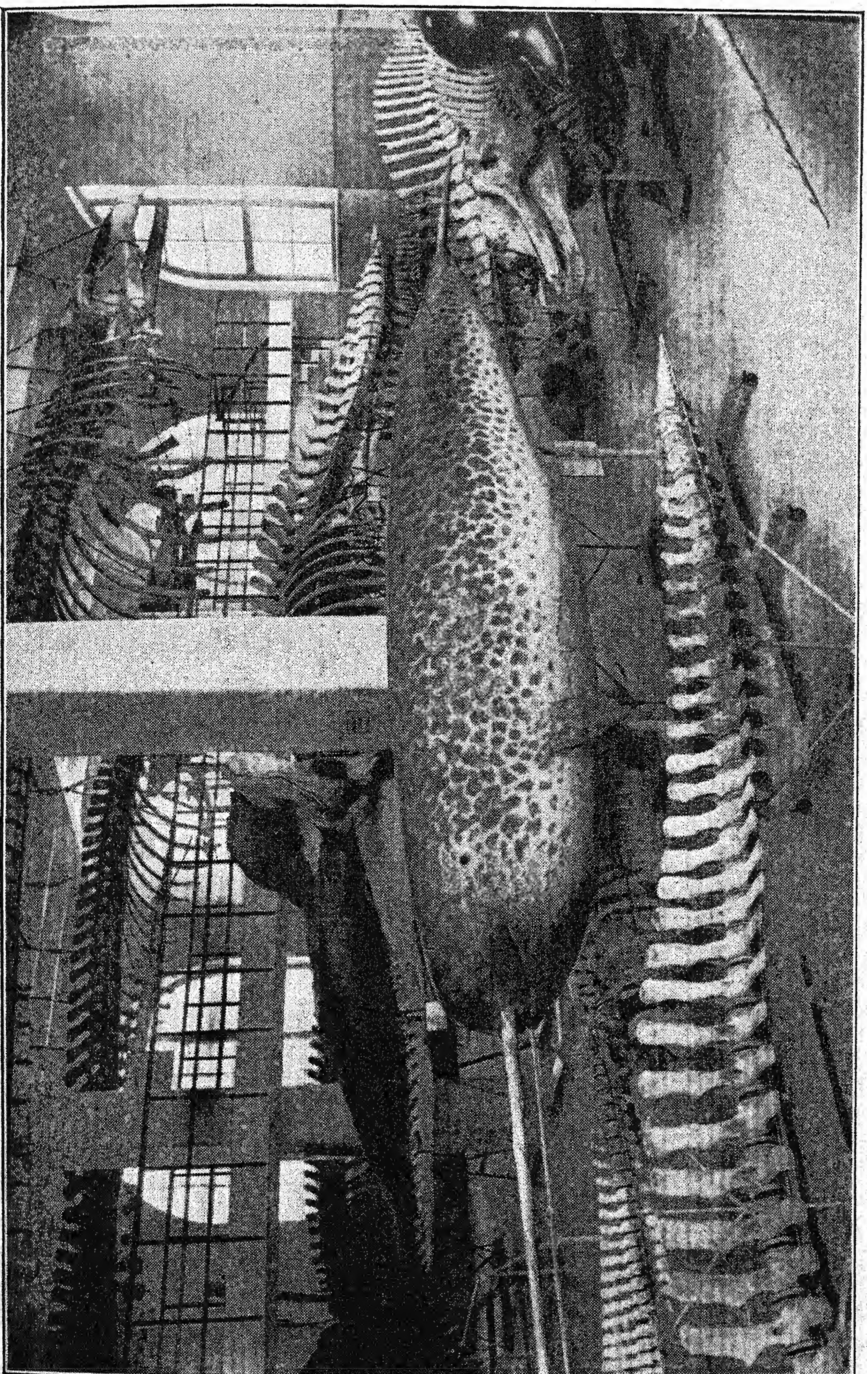
two curators, the one for the botanical and the other for the zoological and ethnographical collections.

In the following year, 1819, a great change was brought about by the efforts of Baron Gustaf Paykull. A member of the Academy, he was keenly interested in zoology, and particularly in entomology and ornithology. It may incidentally be noted that he originally established the interesting genus of wading-birds, *Dromas*, the type specimen of which still survives. A great traveller, he had visited the natural history museums of many countries, and at his estate, Vallox-Säby, about 30 miles (50 kilometres) north of Stockholm, he had formed quite a considerable zoological collection. It was he who in his later years put forward the idea that there should be a State Natural History Museum in Sweden. He submitted the proposal to King Carl XIV Johan, and at the same time offered to present, under certain conditions, the whole of his private collections to such a museum. The King viewed the proposal favourably, and, when consulting the Academy as to the best way of giving effect to it, offered a site for the Museum. The Academy was fully conscious of the importance of the establishment of such a museum for the study of natural history in Sweden and warmly supported the proposal; but, inasmuch as the sites offered by the King were not wholly suitable, it was suggested that Baron Paykull's collection should be joined together with those belonging to the Academy to form the New State Natural History Museum. This proposal was approved; and the establishment of the Riksmuseum was sanctioned by the King in a Royal letter, dated June 16, 1819. By it the Museum was committed to the care and supervision of the Royal Academy of Science, an arrangement that still continues, for the Academy constitutes itself the Board of Trustees.

As speedily as possible, Baron Paykull's collection was removed to Stockholm. The register shows that it contained 1362 birds, all in boxes with glazed covers, a very large number of insects—there were, for instance, 1422 specimens of Lepidoptera—as well as many mammals, including big ones, and various other kinds of animals. The collections in the Riksmuseum at once began to grow rapidly, and in consequence complaints were soon made that the rooms were too crowded. As early as 1823 the Academy had to place three cabinets, containing mineral specimens presented to the Museum, in the Assembly Room and two more in the Antechamber. Finally, in 1828 the Academy decided to buy a larger building for the Museum, and in the following year, after it had been put into



WHALE MUSEUM.



WHALE MUSEUM.

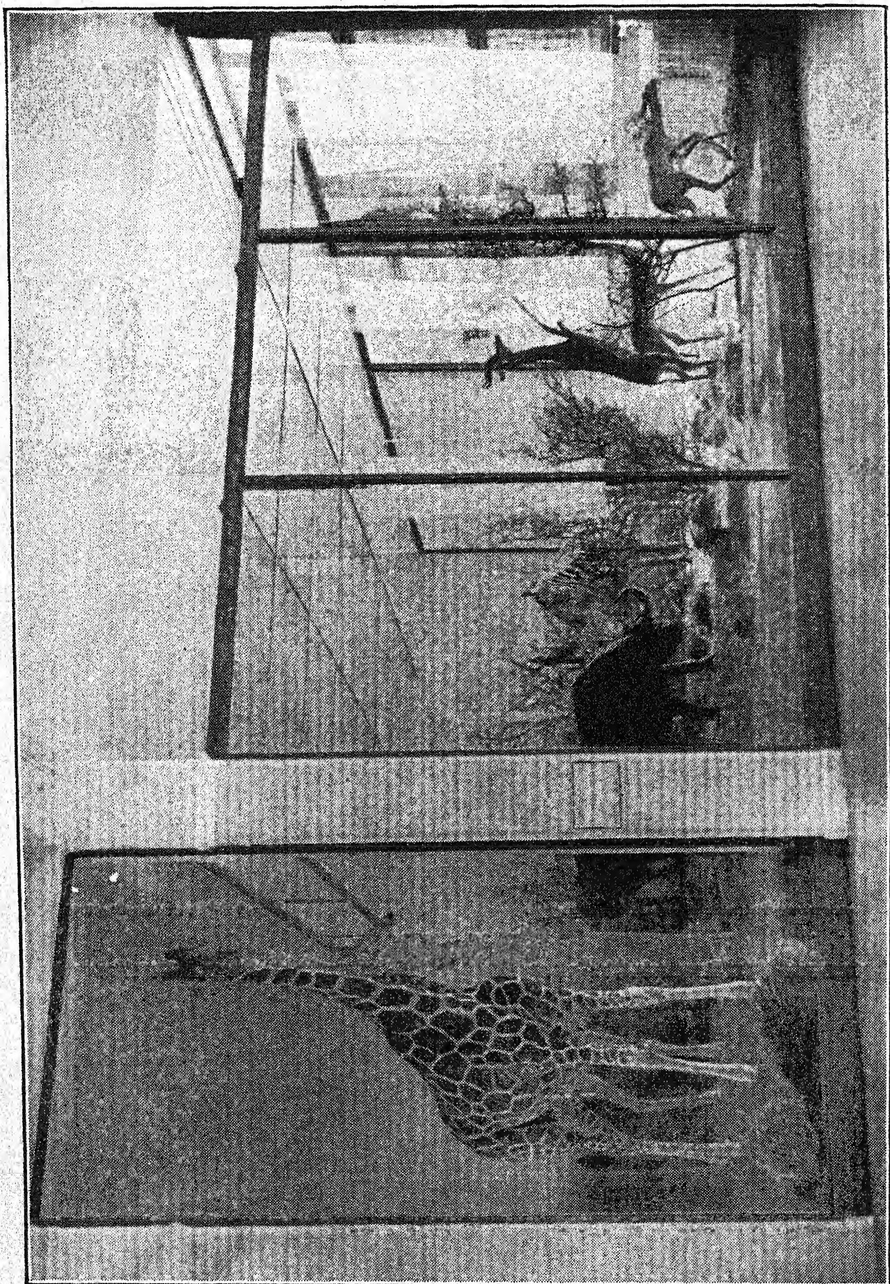
thorough repair, the collections were gradually removed to the new building. The rooms were now provided with cabinets, which replaced the boxes with glazed tops, as arsenical soap had come into use for the protection of specimens from the attack of moths, which formerly had been responsible for the loss of so many specimens. In 1830 a third department, with its own Intendant, was created for the collection of minerals; by the end of 1835 it is said to have numbered about 12,000 specimens.

The Zoological Department received an important addition in 1829. A. V. Grill, the owner of a manufacturing estate, and his wife had brought together at their home, Söderfors, quite a museum, containing as it did 80 mammals (among them several rarities, as for example, *Hippotragus leucophaeus*, already then extinct), about 700 birds, some fishes, about 700 shells, and corals, etc. The whole collection was presented to the Riksmuseum by their heirs. Prof. Sven Nilsson, who was for a short time, from November 1828 to March 1831, Intendant of the Zoological Department, was much interested in the Swedish fauna, and decided therefore to form a representative collection in the Riksmuseum. In this project he and his successor, Prof. B. F. Fries, were assisted by many Swedish sportsmen and others interested in it. He extended his operations to the marine fauna of the western coasts, and, in association with Dr. Sven Lovén, the first Intendant of the Invertebrates Department, was the pioneer in the investigation of marine zoology in Sweden. The grants from the State were far from large, and, although the Academy from time to time gave financial assistance, the funds for the acquisition of specimens were inadequate. Prof. Fries therefore endeavoured to add to the collections by enlisting the aid of friends in various parts of Sweden to collect specimens which he was able to exchange for others wanted from abroad. At the same time the Museum received many gifts, including large collections, of which the most important was that made by Dr. Hedenborg during his extensive travels in West Asia and North-east Africa. Unhappily the Museum lost the services of this energetic and enterprising Intendant by death in 1839.

In 1841 the Zoological Department was divided into three: Vertebrates, Insects, and Invertebrates, the respective Intendants being Dr. C. J. Sundevall, who had succeeded Prof. Fries, Prof. C. J. Boheman, and Dr. Sven Lovén.

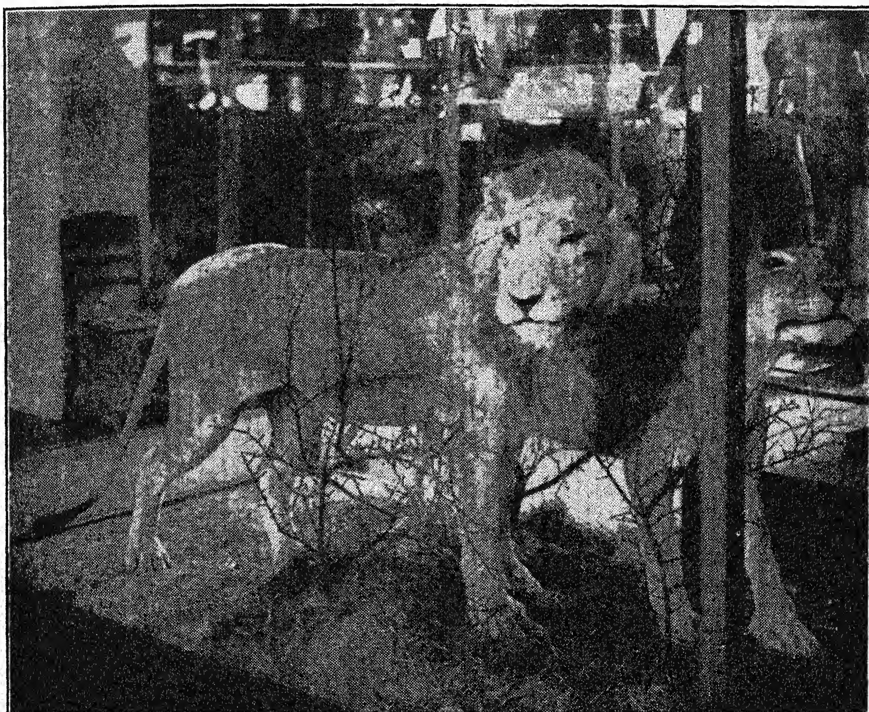
The Museum benefited by the collections made by J. A. Wahlberg in South Africa in the years 1838 to 1844 and 1854 to 1856, when he was killed by an elephant; and to such an

Bird Room.
The cabinets contain the collection of bird-skins.



East African Scene.

extent that in 1845 it could be said that the Museum contained examples of as many as 530 species of mammals, about one-third of the total known at that time. As, according to the views then held, many of the specimens could be considered as duplicates, Sundevall was able to effect exchanges with other Museums, and in particular to build up a very rich collection of birds, a group in which he was greatly interested. The Museum benefited by the collections made by various expeditions, such



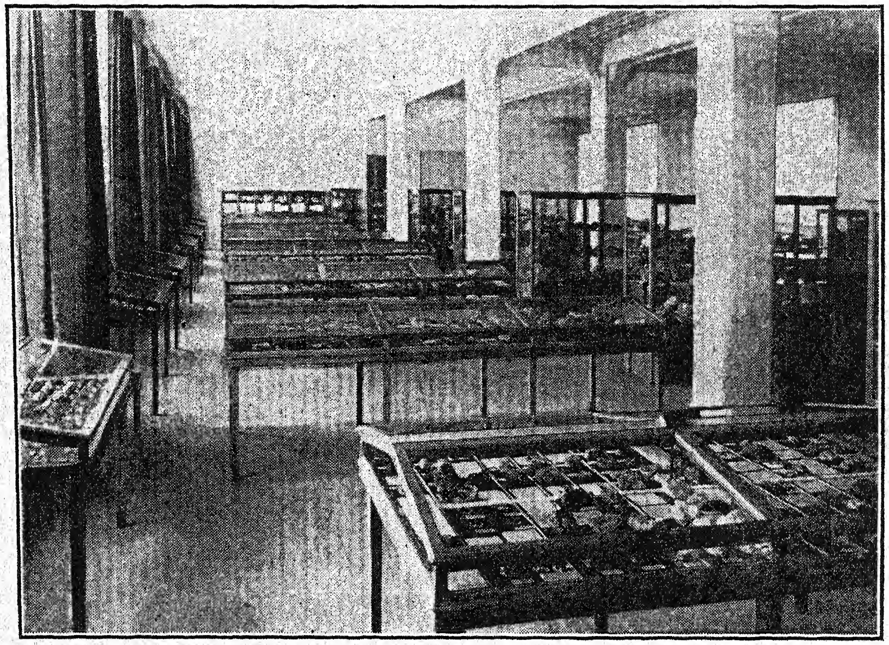
SPECIMEN OF THE SMALL CENTRAL AFRICAN LION (*Felis leo bleyenberghi*).

as that of H.M. Frigate "Eugenie" round the world from 1851 to 1853, and that of the "Vega" round Asia and Europe.

Prof. A. E. Nordenskiöld, the chief of the "Vega" expedition, was Intendant of the Department of Mineralogy for upwards of forty years, from 1860 to his death in 1901, and thanks to his energy the Department was greatly enriched during his tenure of office; he devoted much attention to meteorites, and at the end of his life the collection contained examples from no fewer than 277 localities. His successor, Prof. Hj. Sjögren, presented the whole of his private collection of minerals,

numbering 6852 specimens, and the beautiful cabinets containing it, on condition that it was kept separate for all time. In later years the Department has been enriched by specimens of Swedish minerals, prominent among which are the interesting ones occurring at Långban. Prof. G. Aminoff, the present Intendant has equipped a laboratory with the apparatus required for modern research.

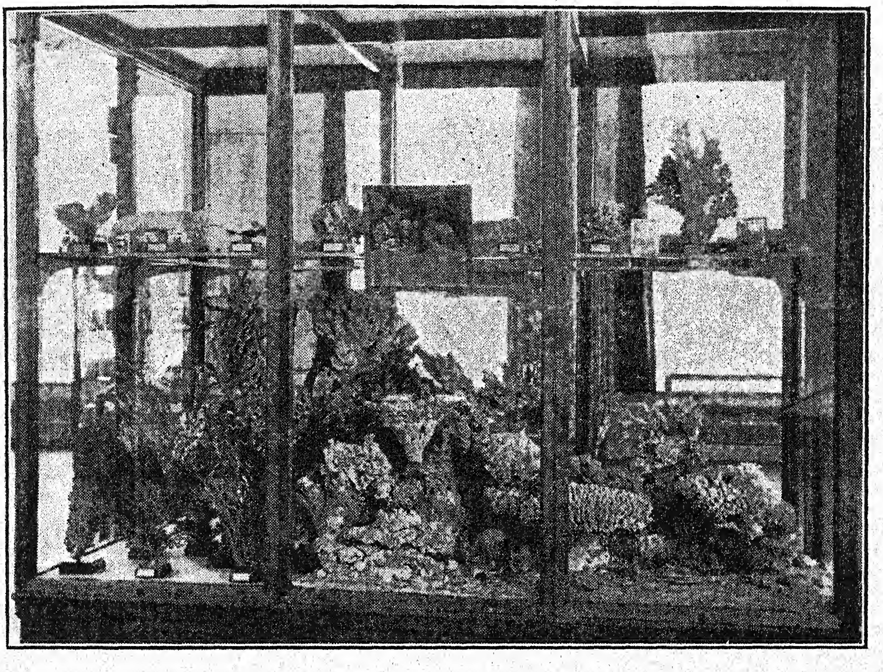
In 1864 a Department of Palaeontology was created, containing both fossil animals and fossil plants, but so rich were the



Mineralogical Gallery.

collections of fossil plants brought back by successive Swedish Arctic expeditions, that the Department was divided into two: Palaeozoological and Palaeobotanical. The former is particularly rich in finds from the Silurian deposits of Sweden, and includes the types of the descriptions of Angelin, Lindström, and Holm, the successive Intendants of the Department. During recent years valuable collections of fossil fishes have been acquired, which have been the subject of the well-known researches of the present Intendant, Prof. Stensiö. The first Intendant of the Department of Palaeobotany, Prof. A. G. Nathorst, made important discoveries of sub-fossil plants,

belonging to Arctic species, which grew in Southern Sweden at the close of the Ice Age. By additions from the Antarctic as well as from Spitsbergen and Greenland, the Museum contains the most important material for the study of the past vegetation of the Polar regions that exists in any museum; it includes the types and other specimens figured by O. Heer and A. G. Nathorst. Of late years the present Intendant, Prof. T. Halle, has paid close attention to the rich, plant-bearing formations of China and has got together the largest and most important mass of material to be found anywhere outside China.

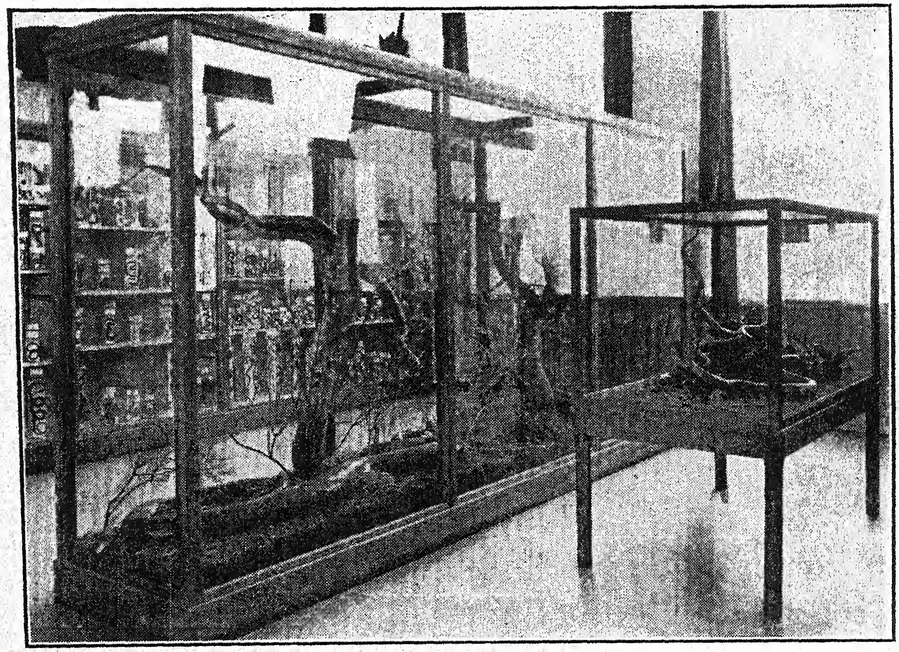


CORAL EXHIBIT.

The Department of Botany contains large collections, not only from Sweden and the Arctic and Antarctic regions explored by Swedish expeditions, but also from many other countries. The Swedish physician, Dr. A. F. Regnell, was a great benefactor. He presented his own herbarium of about 5000 plants, and gave the Academy of Science a sum of money for the preservation and care of Brazilian plants, and in addition a fund for travelling scholarships to enable botanists to visit chiefly Brazil, but other tropical countries in America as well. By this means large collections have been obtained from Brazil and in recent years from Cuba

and Hayti; those from the latter islands were got by the late Dr. E. L. Ekman, and are probably the most extensive ever made there.

Dr. Regnell extended his generosity to the Department of Zoology, and gave the Academy of Science sufficient means for the establishment, in 1877, of a permanent marine biological station at Kristineberg, where the early pioneers had been working in the thirties. The co-operation between the station and the Museum has been intimate because the head (Prefect)



PART OF THE REPTILE GALLERY.
On the left, case containing a *Python reticulatus*, from Siam.

of the former has always been the Intendant of one of the zoological departments.

During the present century the Vertebrate Department has grown rapidly, collections having come from East Africa, East and South Asia, Australia, South America, Antarctica, etc. The mammals now number nearly 10,000, the birds over 66,000 (excluding skeletons), and the reptiles and batrachians over 10,000; no exact number can be given for the fishes.

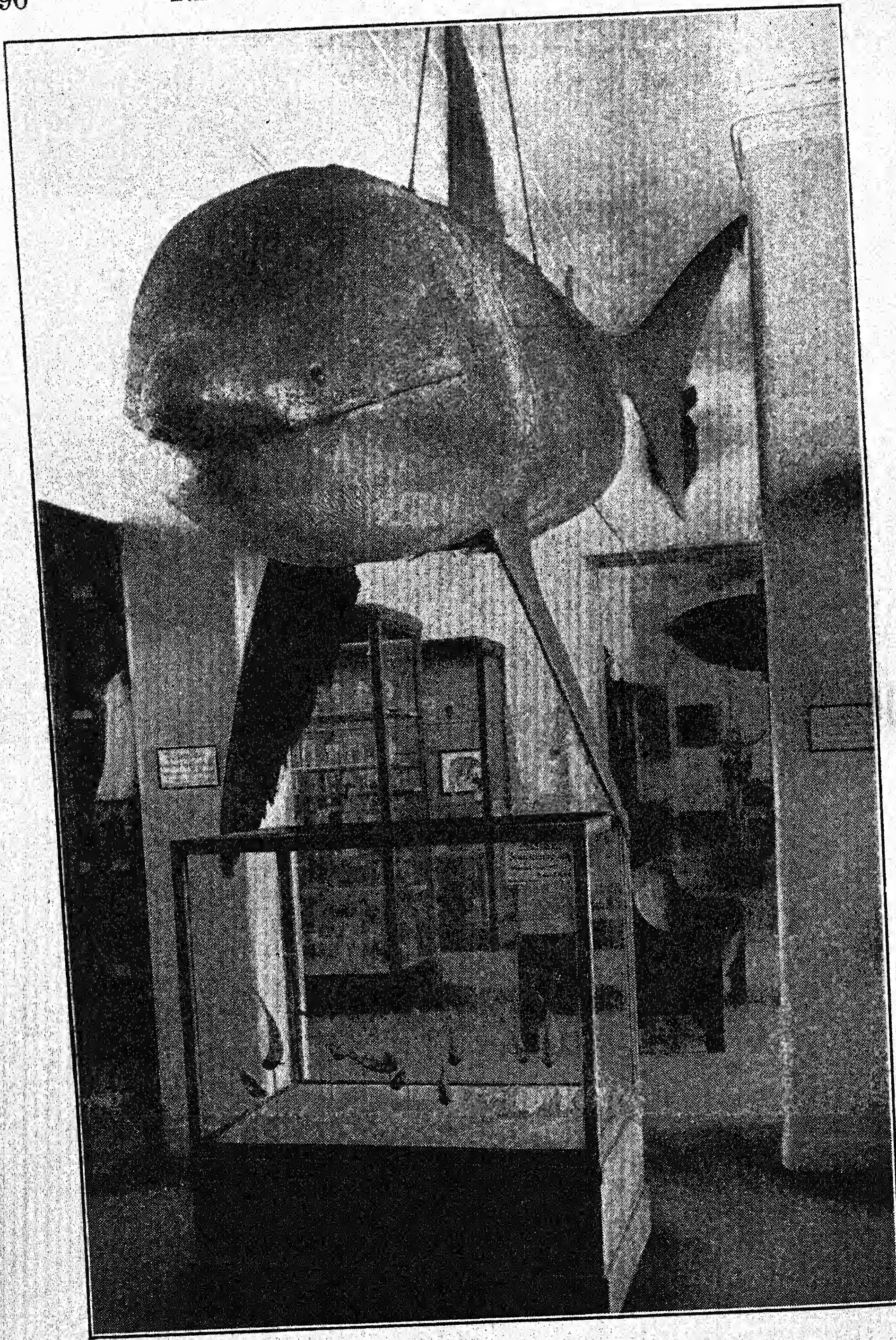
Towards the close of the last century the Riksmuseum began to suffer increasingly from the difficulties of congestion and lack

of space which are common to all growing museums. After much discussion the Government finally granted the money for the erection of new buildings on a free site a little outside the city. At the same time, the Academy decided to move its quarters into close proximity, so that its library, so necessary for scientific work in the Museum, was nearly as accessible as before. Further, it was decided that the Geological Survey of Sweden, having many scientific interests in common with the Riksmuseum, should be housed under the same roof. The first

WHALE SHARK, *Rhineodon typus*.
Cases of Reptile exhibits at the sides.

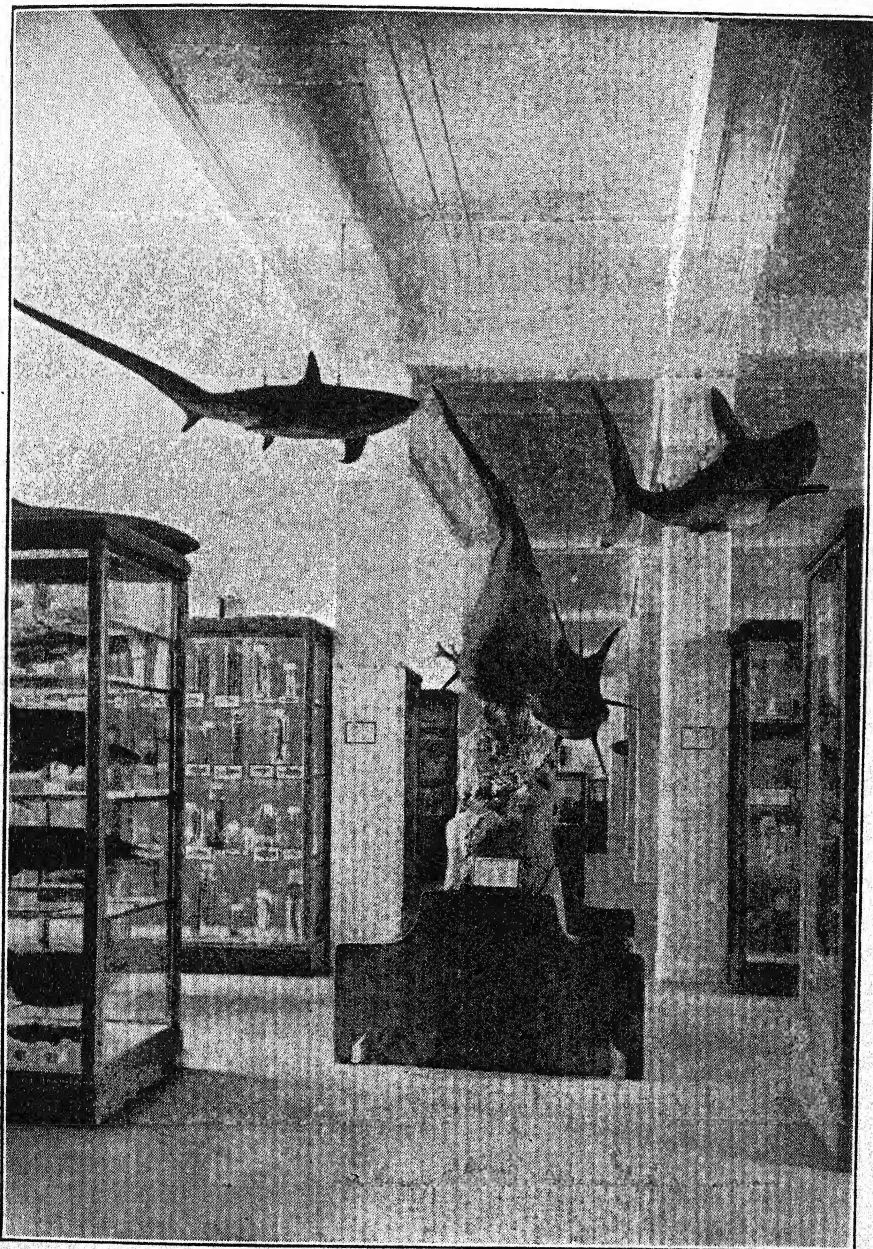
to be erected was the new building for Whales, which was completed in 1908. The main building was begun in the spring of 1910; it was opened by the King in 1916, and thereupon was accessible to the public. The area of the exhibition halls, storeroom, and studies for the several Departments is in square metres as follows: Vertebrates 6100; Invertebrates 1620; Entomology 1390; Palaeozoology 1980; Mineralogy 2270; Palaeobotany 1060; Botany 1850; Geological Survey 3720.

The view from the air shows the general lay-out of the Museum. The flat-roofed building on the extreme left contains the collection of Whales. In the adjoining (north) wing and also



Swedish Fish Gallery.

(Above) Basking Shark, *Cetorhinus maximus*; (below) Dog-fish,



SWEDISH FISH GALLERY.

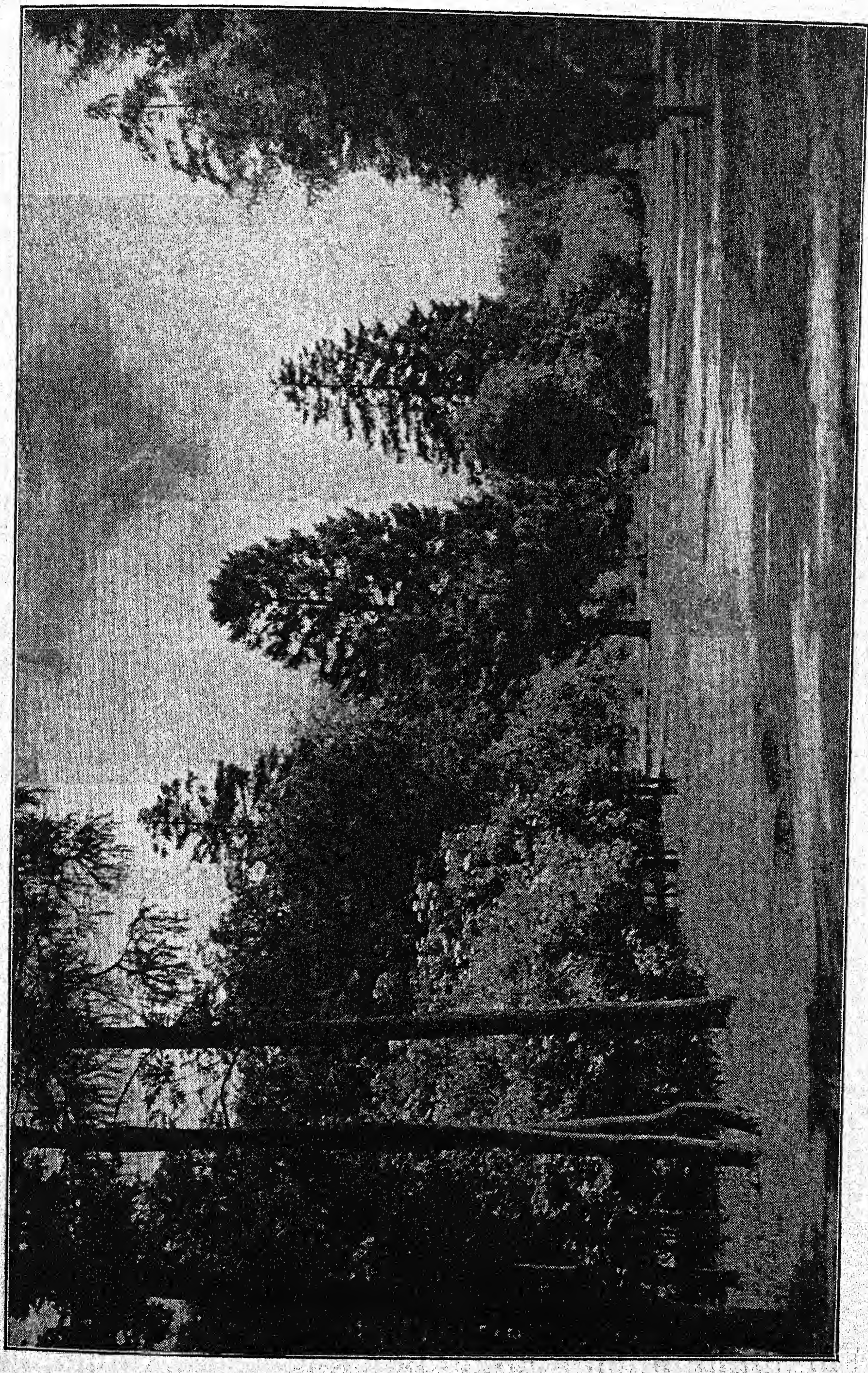
Suspended are three large sharks: (left) Thresher Shark, *Alopias vulpes*; (centre) Greenland Shark, *Somniosus microcephalus*; (right) Porbeagle Shark, *Lamna cornubica*.

in the central section of the main building the ground floor is occupied by the studies and store-rooms, and the first floor by the exhibited series of the Vertebrates Department. On the second floor of the main building the exhibition galleries for the insect and invertebrate collections are on the north side, and those for the palaeozoological collections are on the other side of the central hall. The studies and store-rooms of the Invertebrates Department occupy the upper part of the north wing, and those of the Palaezoological Department such parts of the central section as are not assigned to the Vertebrates Department. The Department of Entomology occupies the highest part of the main building, and the Department of Mineralogy has the front part of the south wing, the exhibition gallery communicating with the Palaeozoological gallery in the main building. The rear half of the south wing belongs to the Geological Survey. The north half of the adjoining building at the back belongs to the Department of Botany, and the south half to the Department of Palaeobotany, the exhibition galleries being on the first floor.

The visitor on entering by the main entrance comes into the Central Hall, in which are the skeletons of two large African elephants and also habitat groups of the fauna of different parts of the world: the Arctic and Antarctic, East Greenland, North America, Western Australia, and East Africa. The Mammal gallery, on the right, contains a large series of specimens interesting to the general public and others important from the scientific aspect. The Bird gallery, on the other side, contains examples of extinct and of rare species, several groups, and an extensive general series. Next to this gallery is a small room containing an historical series of specimens from the old Academy collection and the collections made by Paykull and Grill, all mounted as they originally were and all more than a century old; amongst these old things are some of great scientific value.

From this room the visitor passes into one with a complete collection of Swedish vertebrates, including a number of habitat groups. Next are the exhibits of reptiles and batrachians, with two habitat groups. The next section contains the exhibition of fishes, mostly in alcohol. In the same hall are cases containing Swedish domestic animals and an exhibition of skins used for fur. The last hall is filled with a collection of skeletons of different classes of vertebrates, ranging up to man.

On the second floor to the left is first the exhibition of various series of insects: giant, useful, or noxious insects, beautiful butterflies, and also some groups illustrating the



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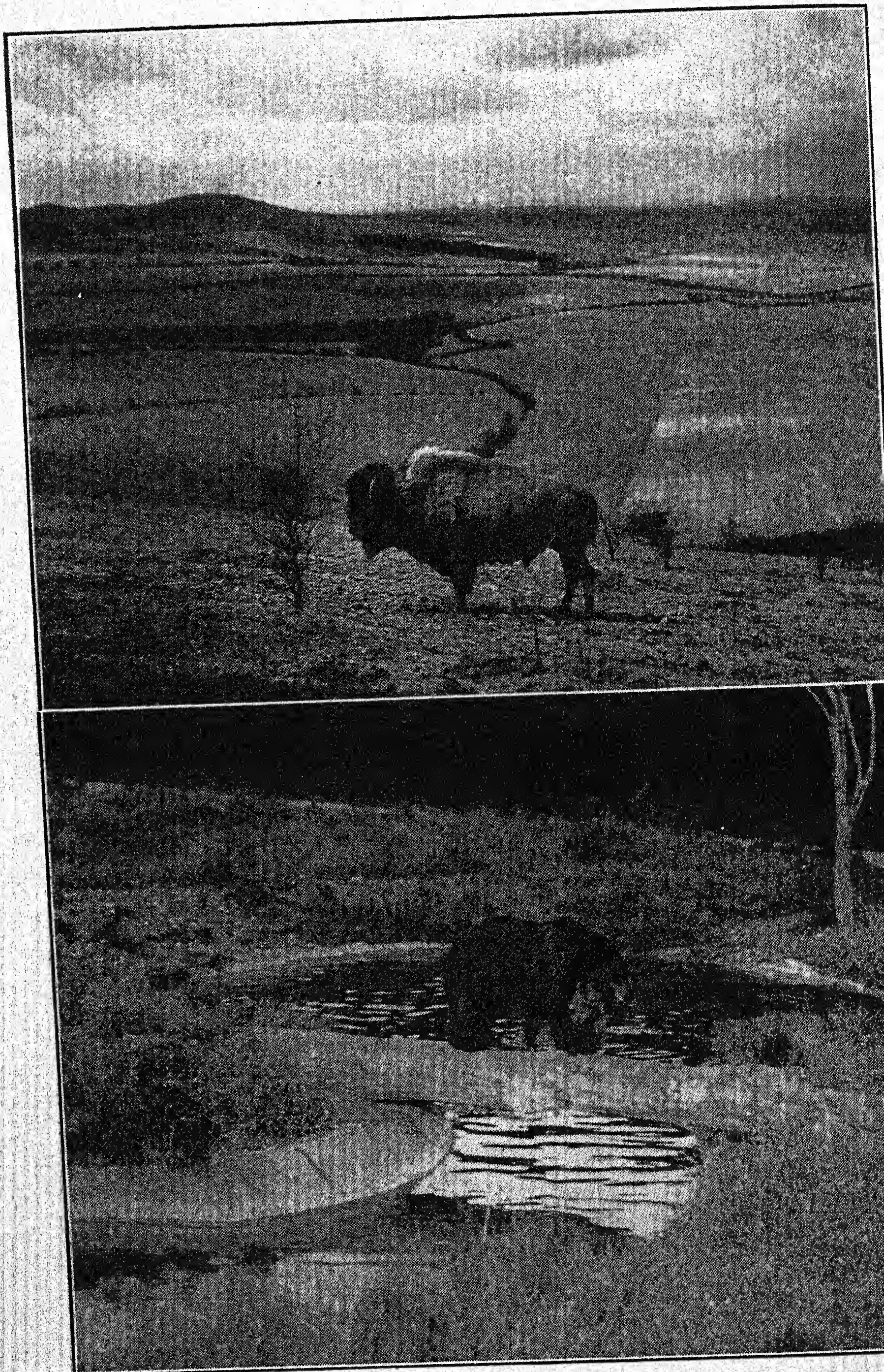
WHIPSNADE ZOO: DUKE'S AVENUE.



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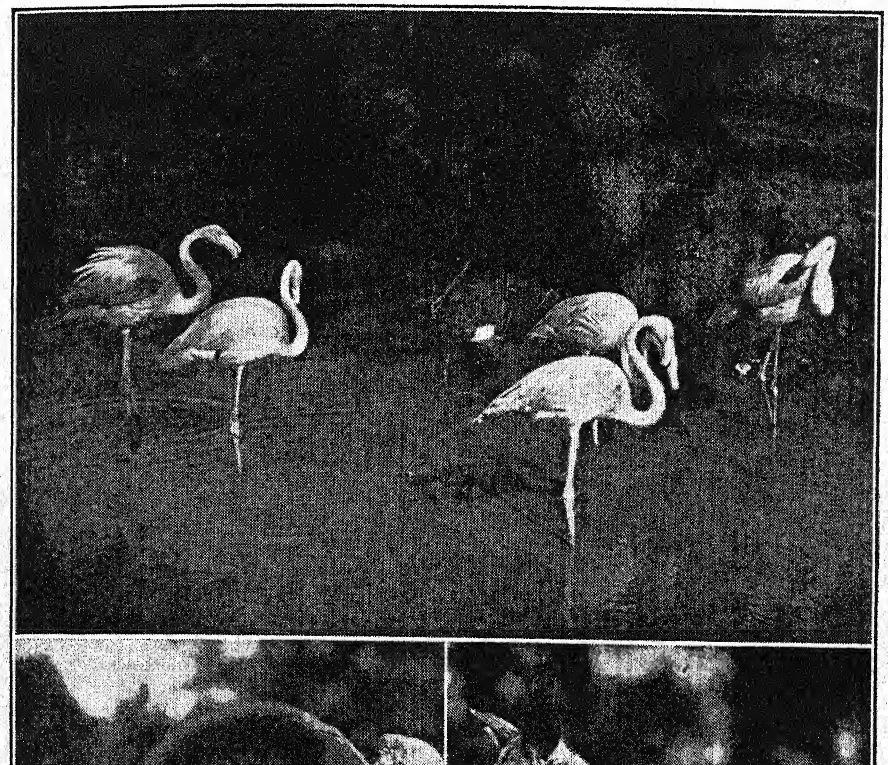
WHIPSNADE ZOO: (Upper) AMERICAN BISON; (Lower) BROWN BEAR.



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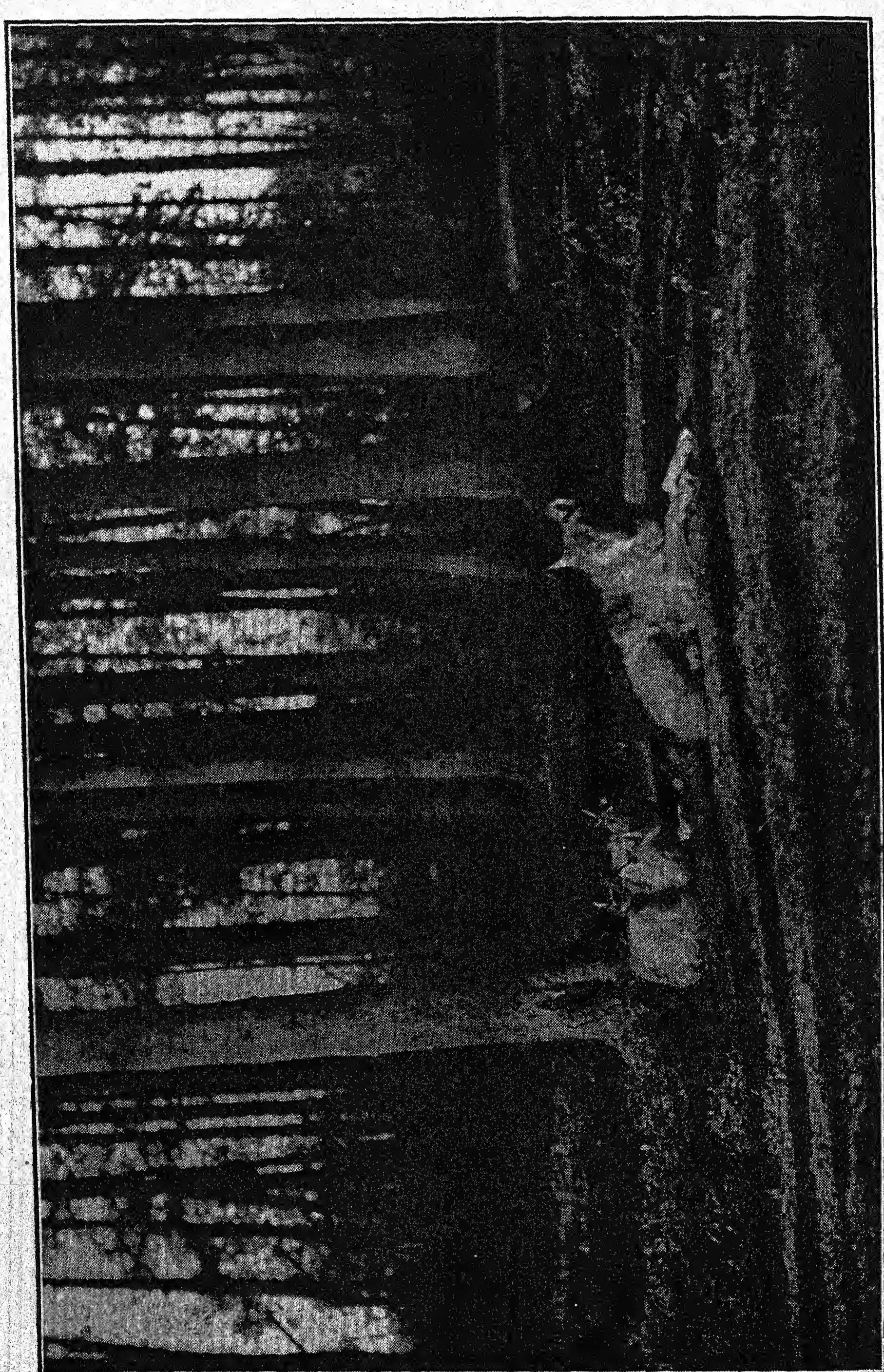
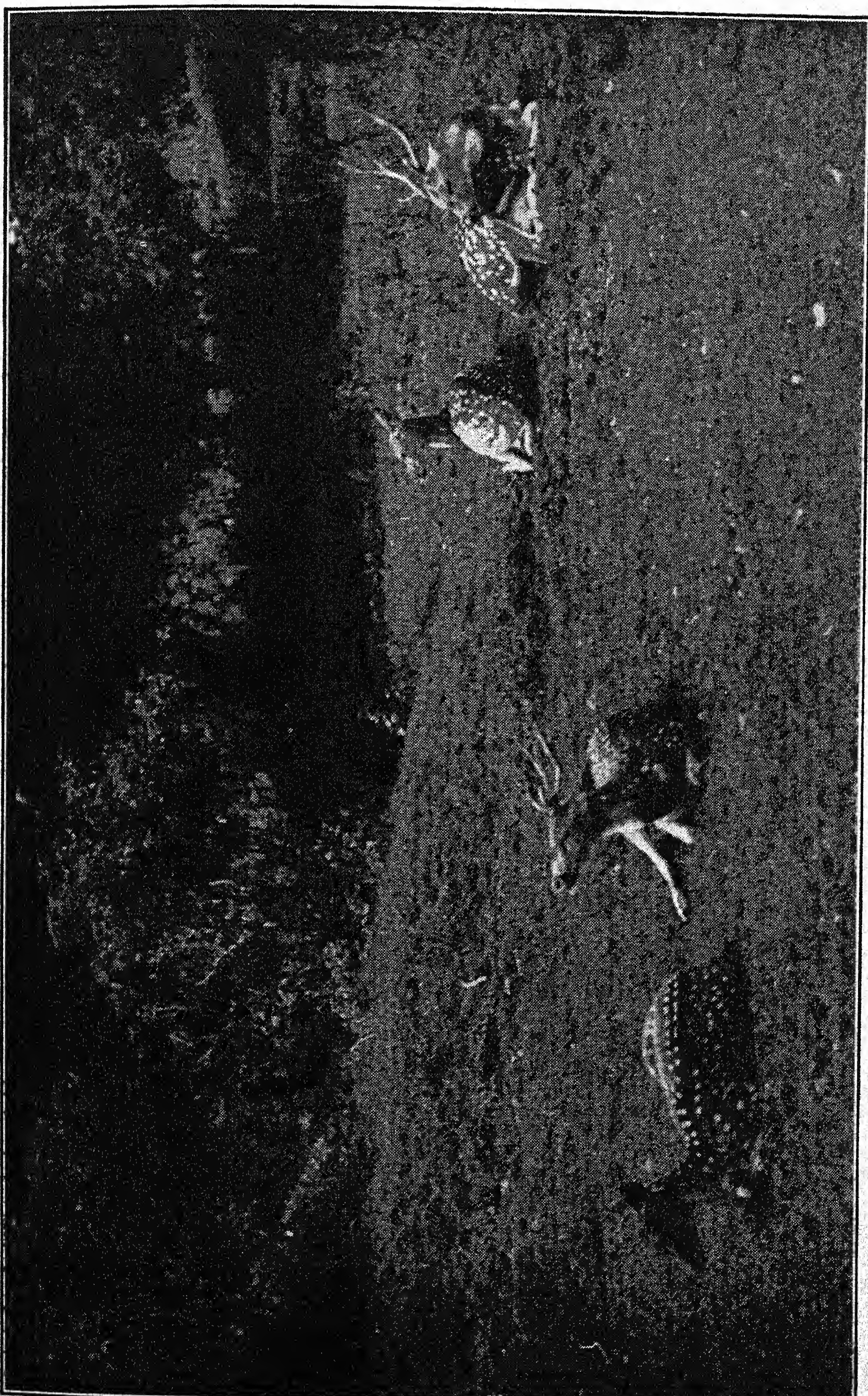
WHIPSNADE ZOO: (Upper) FLAMINGOES; (Lower) HIMALAYAN BEAR, WALLABY AND YOUNG.



WHIPSNADE ZOO: WOLVES.



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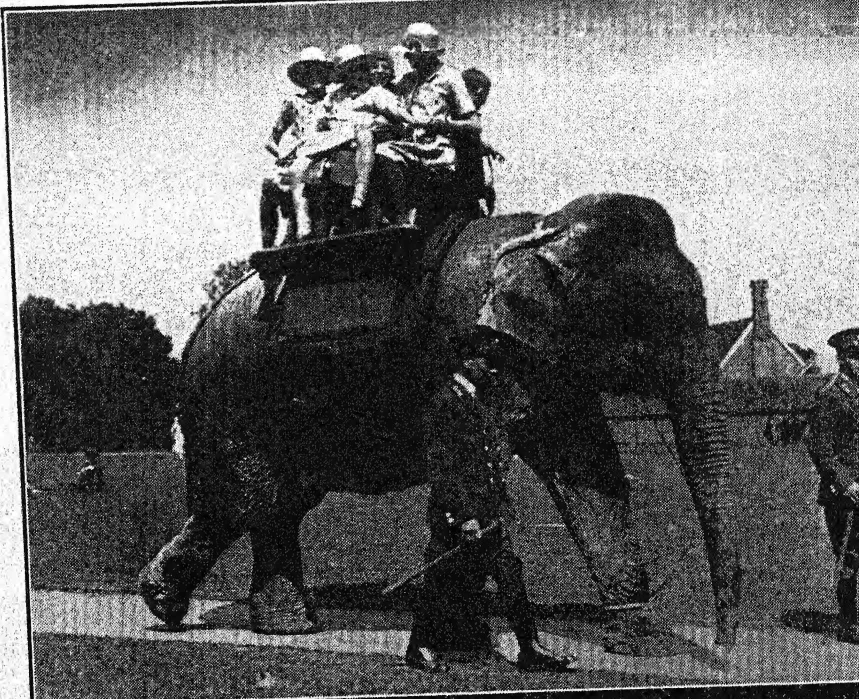
WHIPSNADE ZOO: AXIS DEER.



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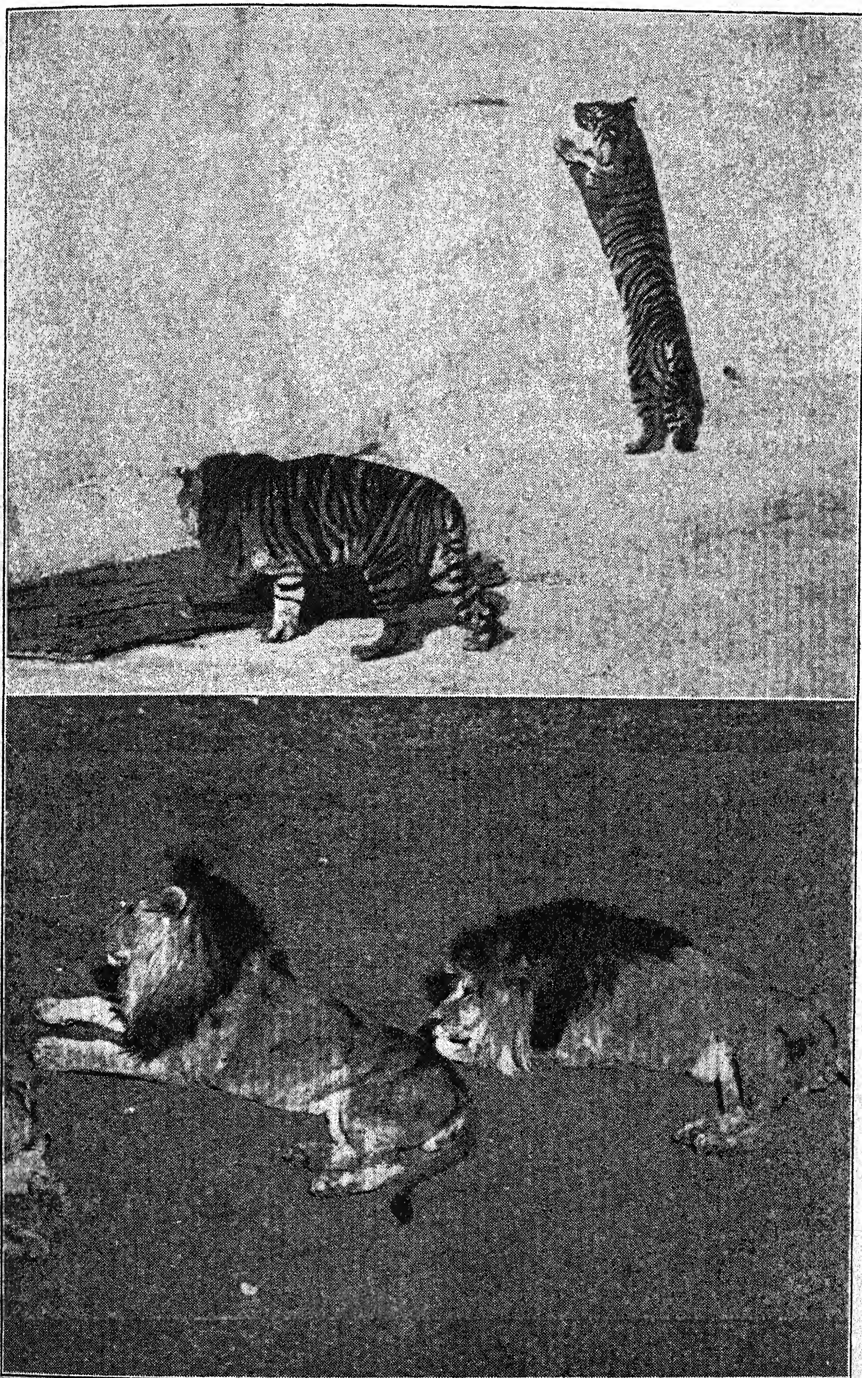
WHIPSNADE ZOO: (Upper) BURMESE ELEPHANT; (Lower) CHAPMAN'S ZEB



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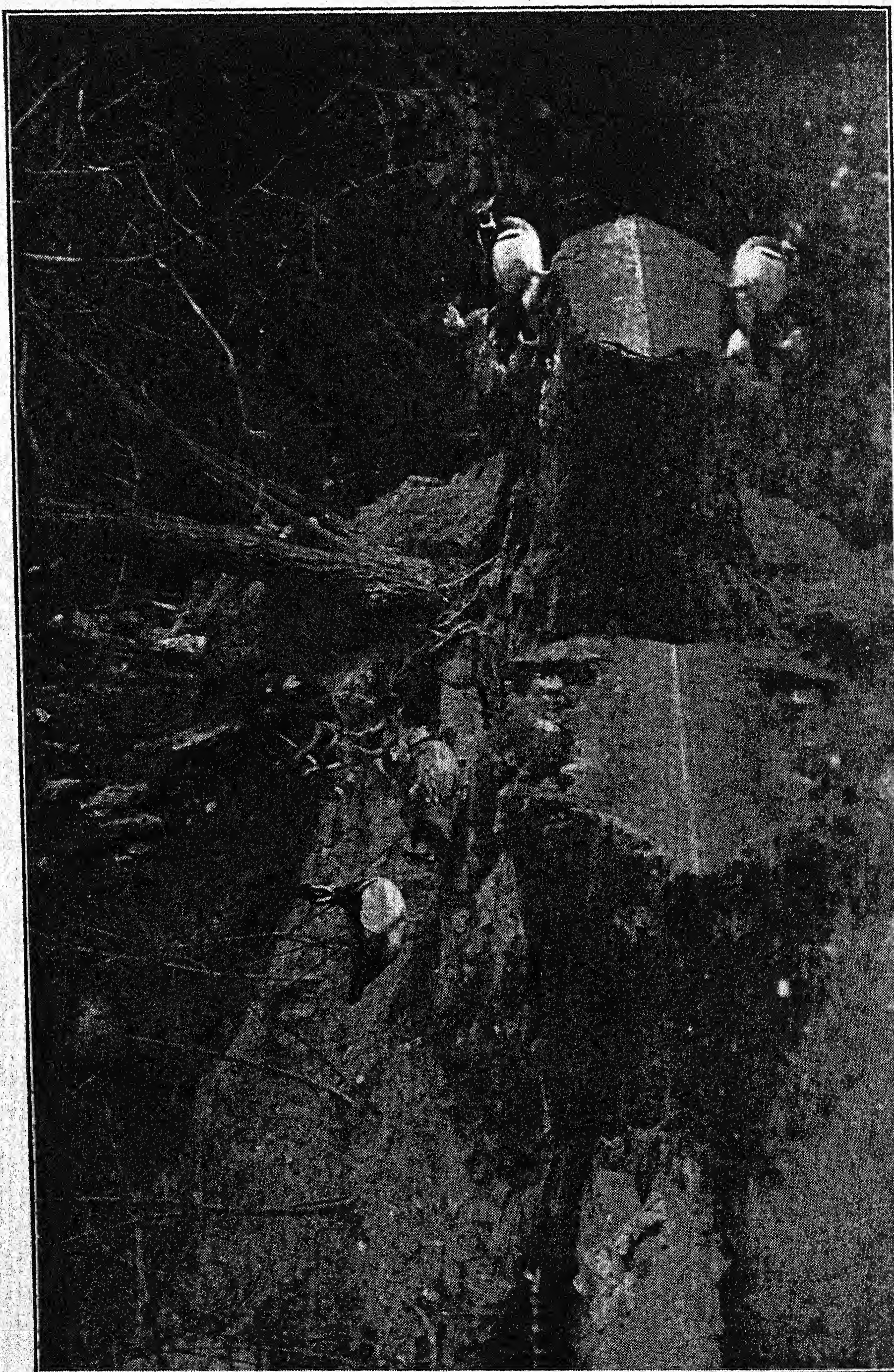
WHIPSNADE ZOO: (Upper) TIGERS; (Lower) LIONS.



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WHIPSNADE ZOO: MANDARIN DUCKS.

rkable termite communities. Next come the invertebrates, a systematic collection of marine animals. On the opposite of the central hall are the large fossil reptiles as well as the ıal material from the Swedish deposits of Silurian age. ng through this gallery, the visitor comes to the minerals, ding ores, and meteorites.

he Whale hall contains an unusually large series of the whales. There are the skeletons of all the Northern es, including a splendid Greenland Whale with a complete f baleen, and also several Antarctic whales. The Grey e (*Rhachianectes*), probably now extinct, is represented by ıplete skeleton, and the skeleton of *Balaenoptera brydei* may ique. Also there are skeletons of Cachalot and Bottlenose es from both the north and the south, a number of small toceti, and a skeleton of the extinct *Rhytina stelleri*.

he Riksmuseum is open on Monday, Tuesday, Thursday, 'riday from 11 a.m. to 3 p.m., on Wednesday and Saturday 12 to 3 p.m., and on Sunday from 1 to 3 p.m.

BEHIND THE SCENES IN THE MUSEUM. III.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

In the second article of this series the work of the Office and several of the sections under its control was briefly described. The largest, and the most important, section directly in the charge of the Office is that of the Works Staff, which includes the Maintenance Staff, and is composed of those persons who are concerned with the artisan side of the Museum's work, with the reception and dispatch of stores and specimens, and with the upkeep of the cabinets and their fittings; a separate staff under the control of His Majesty's Office of Works is responsible for the structure of the building. Essentially these are people who are normally confined to their workshops and who are only occasionally, if ever, under the eye of the visitor. Their comings and goings, like those of the specimens, are by the back-door. This distinction does not demarcate them in any very profound sense from the users of the public entrance, but it does divide the Museum very definitely into two main parts: the one that is connected with the actual public exhibition galleries, and the other that forms a little factory whose workers but seldom penetrate into those places to which the public have access. It is perhaps worth stressing this point; for members of the public on being conducted to the study of one of the Scientific Staff, and having occasion to pass through the workshop area, are almost invariably surprised to see the number and variety of the trades that have to be included in the Museum's precincts.

The subject may be conveniently treated under three headings: the buildings, the specimens, and the personnel.

The workshops of the Maintenance Staff are concentrated along the back of the main Museum building and there also are the tradesman's entrances and the through passage-ways for vehicles arriving with specimens or materials. The front of the Museum may be claimed to form one of the familiar London landmarks; but few people are acquainted with the northern or back aspect (Fig. 1). Bounded on the west by the New Spirit Building, which houses parts of the Entomological and Zoological Departments, and on the east by the newly built Museum of Practical Geology, in which at the moment the Economic Conference meets, the back of the Museum is not visible from either Exhibition Road or Queen's Gate, on to both of which its carriage-ways enter. During the war the ground in this area was used by various military organizations and the huts that

served their purposes long remained as an eyesore. Fortunately the construction of the New Whale Gallery and the Museum of Practical Geology gave the Office of Works an opportunity of improving the Museum's grounds, and the present lay-out combines a spaciousness and dignity in striking contrast to the conditions of a few years ago. Some further improvement and buildings await the coming of more prosperous times, but the present condition is well shown in figure 2.

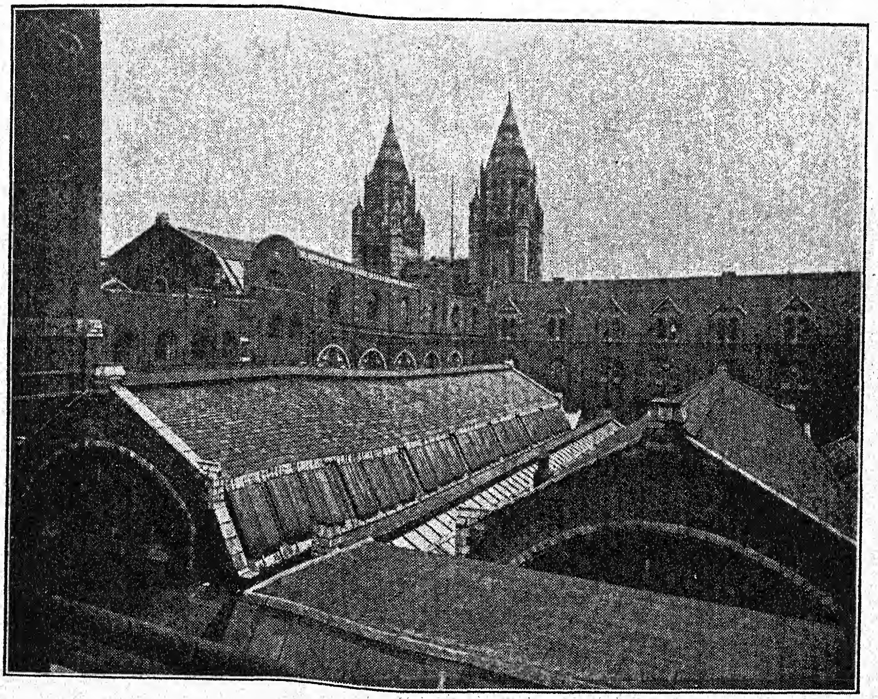

FIG. 1.—MUSEUM MAIN BUILDING FROM THE BACK.

The back of the main part of the Museum building is composed of a colonnade into which the majority of the workshops open. There are several other laboratories and workshops in other parts of the building, but these will be dealt with later under the various Departments.

It has been said that the back entrances open on to Exhibition Road and Queen's Gate, but it is by the former that the main part of the collections and stores arrive. All specimens too large to be sent by post or to be conveyed by hand come by this back-door route, and the specimen may vary from a small stuffed animal to a whale, or to a great prehistoric reptile, whose

bones have to be conveyed on a steam wagon, and the collection from one small box to hundreds of heavy packing-cases. Naturally, every specimen and every box, heavy or light, has to be handled with the greatest caution, so that one of the first needs is for a staff trained to handle boxes with care, and actually to understand the meaning of those admonitory labels which so often prove futile. Enthusiasm and energy are qualities seldom

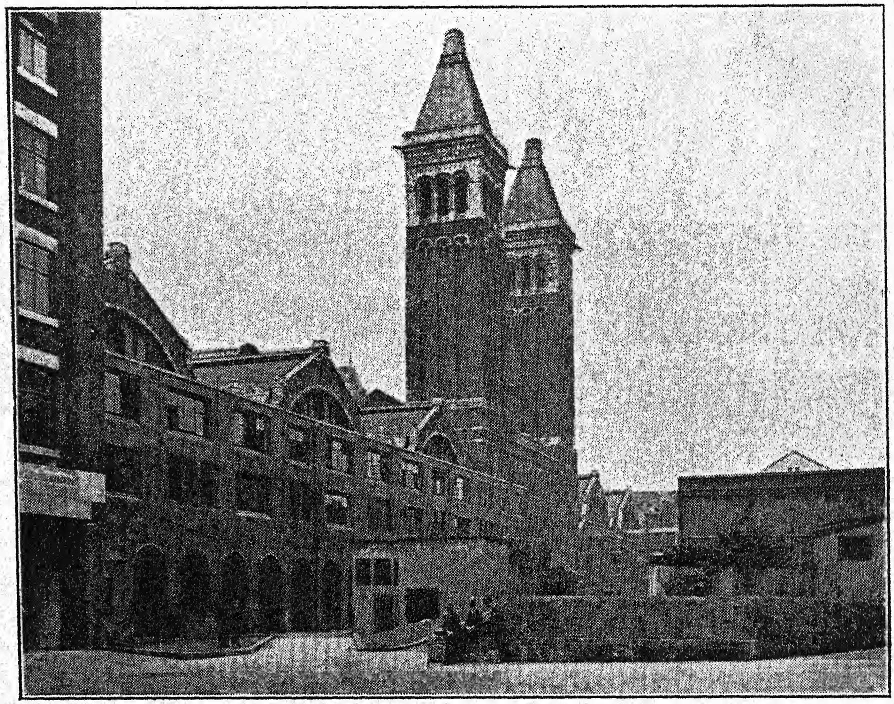

FIG. 2.—MUSEUM BUILDINGS, NORTH-EAST CORNER.

Old Spirit Building on right, roof of new Whale building beyond. Fan-chamber in centre. Studies of Department of Geology, in two storeys, above colonnade. Corner of new Museum of Practical Geology on left.

to be discouraged, but their display when unpacking or handling a valuable collection should be modified. In this connexion it may be mentioned that the Customs authorities have much to answer museums for, and that Customs examination has on occasion done more harm to a collection than a long voyage and the rigours of expeditionary travel. The Museum is fortunate in this respect, for all material is permitted to enter it under seal and to have the examination conducted on the premises under conditions that ensure due appreciation of the contents. As

many of these specimens are priceless in that they are irreplaceable, it will be realized that the stress laid on the most careful handling is not unnecessary.

All boxes arriving at the Museum are carefully examined, checked, and, as soon as possible, transferred to the appropriate scientific Department for treatment. As specimens which are packed for travelling are not necessarily in a condition for continued storage, immediate unpacking and some form of treatment before use or storage is essential, so that these duties engage the constant attention of a number of men. The amount of material constantly arriving from, or leaving the Museum for, all parts of the world is considerable, so that quite a busy clearing house is maintained. The approaches to the Museum are suitable for every type of road vehicle and the mechanical methods for dealing with heavy boxes are adequate. An ordinary hand-crane (Fig. 3) and a gantry crane meet most requirements. For the transfer of heavy specimens from the ground to higher levels there is a hydraulic hoist in the Geological Department, while it may interest visitors to know that there is a crane in the Central Hall which raises specimens to any floor required through an opening in the floor just at the Bookstall (Fig. 4). This latter process is always accomplished between 7 a.m., when the workshops open, and 10 a.m., when the Museum is open to the public. Of course, moving specimens by cranes is an ordinary procedure by very ordinary means, but the handling of stuffed elephants, dinosaur skeletons, or meteorites is not, or at least it should not be, quite so simple or carefree an operation as the handling of sacks of potatoes or bags of coal. How many visitors to museums, who think that things move slowly in the exhibition galleries, pause to consider the processes involved; of the long, careful, and skilled work necessary to prepare and mount, for example, a stuffed giraffe and, though it is the least part of the work, of the difficulty of moving the specimen; for animals like giraffes are not usually stuffed and prepared in the middle of public galleries? At any rate a little reflexion will show that there is no stage in museum work where carelessness is safe and that in most cases the apparently ordinary processes are full of danger if the staff be not trained and appreciative of the things that they handle.

The number of the Works Staff normally employed about the Museum is nearly one hundred, and of these eighty or so are on the Museum staff; the remainder are employees of the Office of Works. The Museum Works Staff is directly under the control of the Director's Office, but is itself supervised by the General Foreman. There is also an Assistant Foreman and Storekeeper

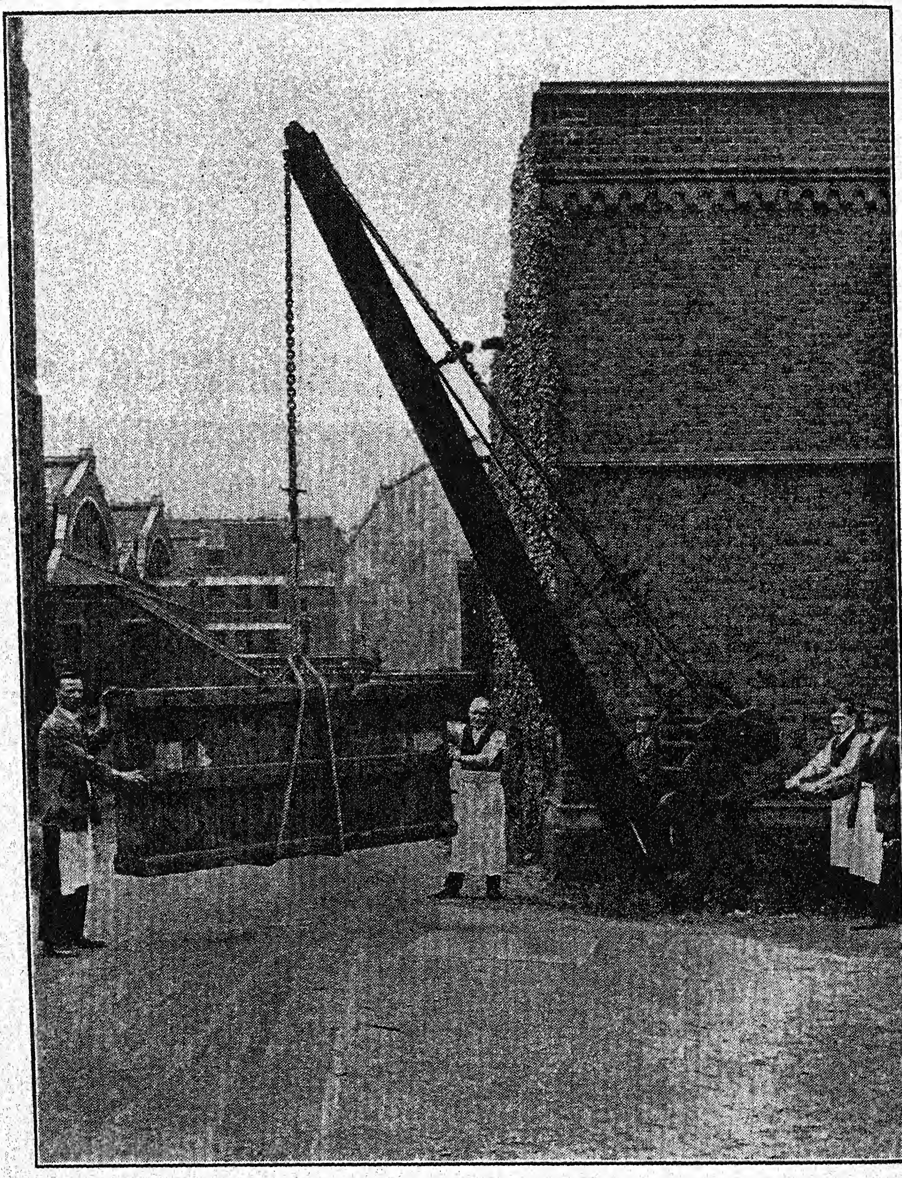

Fig. 3.—Hand-crane for Heavy Cases.
Adjoining it is the old Spirit Building.

and a Timekeeper, whose duties are sufficiently obvious from their titles. The engineering side is under the care of the Office of Works. Of the Museum Works Staff a number have already

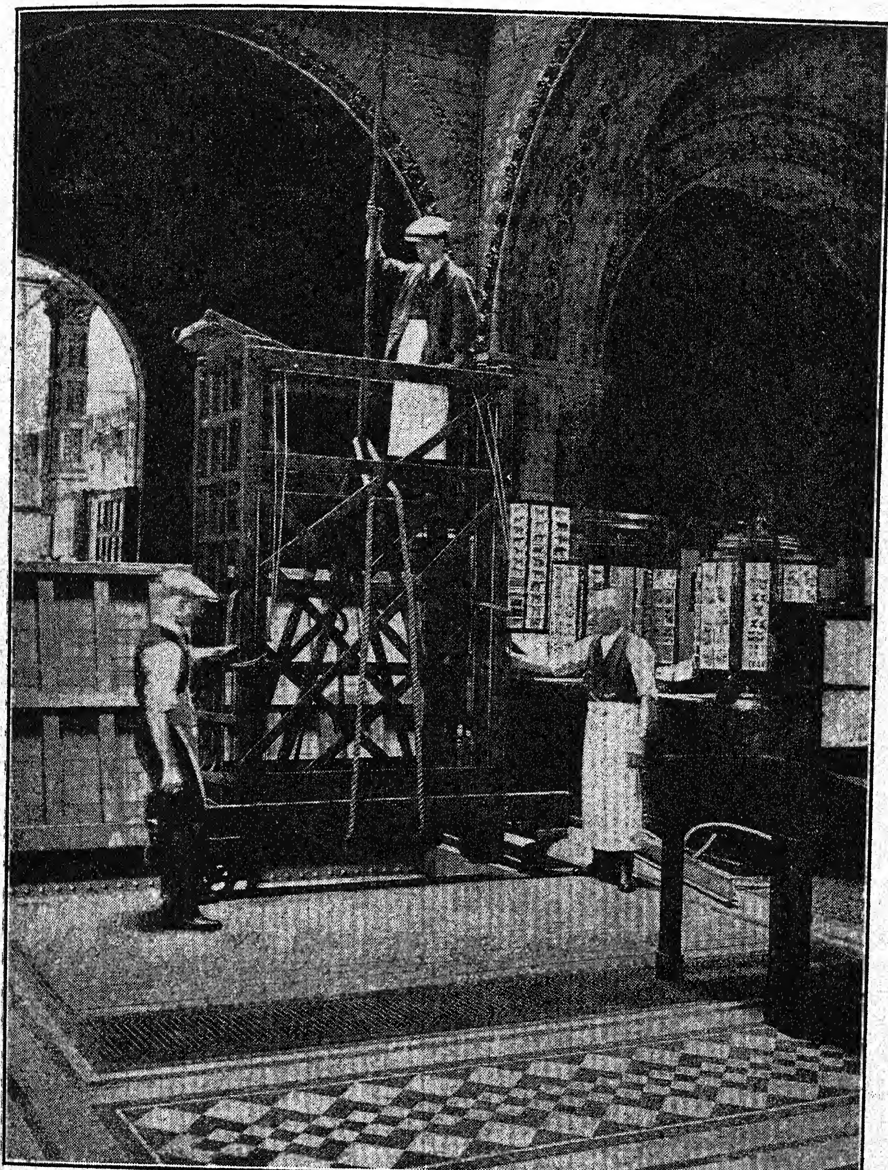

Fig. 4.—Trap and Hoist in Central Hall.

been mentioned in the first of these articles, namely, the Firemen, Gate Attendants, and Housemen, whose duties are concerned with maintaining the safety and cleanliness of the Museum.

Every visitor will have noticed that the specimens are all

specially mounted in one way or another. Some are on mahogany bases, others on specially fitting stands literally made to measure, many on tablets, and most of them in well-finished wall- or table-cases. All these methods of mounting must be efficient, that is, they must suit the individual needs of the specimen in fit and in strength without being so obtrusive as to detract from its exhibition value. In addition, the cases have to be dust-proof and air-tight. The amount of time and work that must go to the complete preparation of a specimen is seldom realized, but a case or a mounted skeleton may well take months to prepare. New exhibits are constantly being set up, temporary exhibitions have to be arranged, stereoramas and dioramas are under construction, and the older cases and the general run of exhibition galleries have to be constantly surveyed and renovated. In addition, there are the hundred and one pieces of work required in making crates and packing cases, and all sort of minor fittings for exhibits and articles for studies, workshops, and store-rooms. The quality of most of this work is in keeping with the value of the specimens, and may readily be appreciated by even an untutored eye in the Museum galleries. For all these undertakings the Museum worker is dependent upon the joiners, and the Museum is fortunate in the men employed in this capacity. Their skill saves the Museum—and, incidentally, the tax-payer—hundreds of pounds every year; for the cost of most of the articles that they manufacture, when done by outside contractors, would be considerably higher than is now the case.

There are two well-equipped joiners' shops, one in the eastern and one in the western part of the main building, and there are ten men in constant employment. A few years ago the Maintenance Staff was employed through contractors, but now it is directly employed. The amount of power-driven machinery has been considerably increased of late years. It is all concentrated into the machine-shop, which is a spacious and well-fitted workroom very suitable for the class of work which must be obtained from it. The wood-working machinery in use consists of circular saw, planer, planer and thicknesser, French spindle, and grinder, all of them operated by electricity. Figure 5 gives a view of the machine shop. All the classes of work wanted by the Museum can be supplied by such a shop and many beautifully turned mahogany stands, frames, bases, and pedestals are produced. The eastern shop is occupied by three joiners who work principally for the Geological and Mineral Departments, and who produce most of the carefully finished and well-fitting wooden mounts required for the display of such varied objects as precious

stones and giant prehistoric skeletons. It is unfortunate that the careful and highly skilled work done by these men is so little realized and that so often they are referred to as carpenters.

But mounts and cases are not made by joiners alone, and the smiths, the painter, and the polisher have all their parts to play. The Museum maintains a small, but well-furnished smith's shop, where a smith and his assistant preside over lathe and forge, so that the traditional music of the country smithy can occasion-

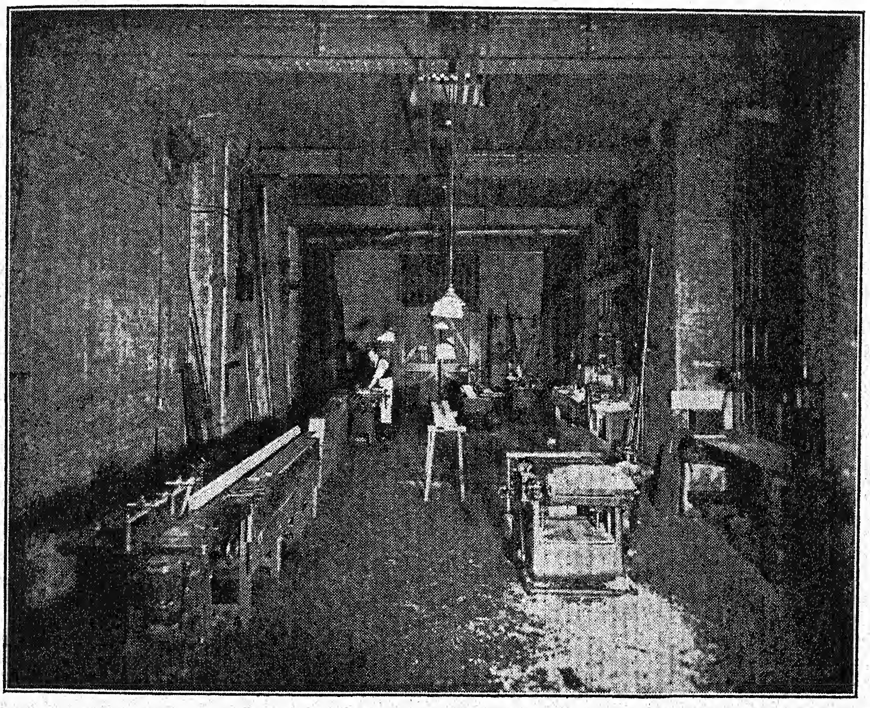

FIG. 5.—WOOD-WORKING MACHINE SHOP.

ally be heard to echo in the museum. There is plenty of business too even if there is never a horse to be shod, or an iron tyre to be shrunk on to a felloe. There are locks and keys in plenty to be mended, scores of iron fittings to be repaired or moulded, and, if one looks at one of the mounted skeletons of fossil mammals or reptiles and sees the wrought iron support that bends and twists to conform to every feature of the back bone and limbs it bears, one can realize some of the tasks that keep the forge-fire cheery and the sparks flying.

When the joiner and smith have done their turn the painter

and polisher have to step in, and for both again there is always plenty to do. Each has a spacious and fully equipped shop, where the fine end to a good job can conveniently be applied. In many ways the painter's and the polisher's work in the Museum is like that of their confrères of the Forth Bridge. It is never done; for when one end is finished they have to begin all over again at the other. Constant renewals, and refreshing old cases, fill in all available gaps between new jobs.

In addition there is the glazier and plumber who also has his shop and his steady trade, for there is no unemployment here. The area of glass in the Museum galleries alone, and the amount used in shelving, for exhibits, special cases, dioramas, etc., makes any elaboration of the need for this member of the staff unnecessary. It should be remembered, however, that what has been said of all these craftsmen is concerned with the actual Museum work for the public only and does not include the great amount of maintenance work constantly necessary in any large building for whatever purpose, though this work on the general fabric is mostly done by the Office of Works.

It is impossible to close this account without reference to the electricians of the Office of Works, who, though they are mainly concerned with the general aspect of the Museum, are responsible for much of great exhibition value, and are a constant assistance to the scientific workers in the study or in the preparators' shops. The Museum possesses so much varied electrical apparatus that a good staff in constant attendance is necessary. There are hundreds of electric lights and points for various purposes, electric heating, and refrigerating plants, electrically controlled thermostats, an X-ray outfit of high voltage, electrically operated pneumatic drills and hammers, passenger lifts, to say nothing of the many 'gadgets' used for exhibition purposes, as, for example, the ultra-violet lamp on the first floor and the Elephant Scene in the Central Hall. Many laboratory processes and study methods employ electrical devices on both alternating and direct currents, and the mere fact that all these requirements are readily and unostentatiously met is a testimony to the electricians that needs no elaboration.

Add to all these workers those that are necessary for sending off parcels and publications, for ensuring the safety and comfort of the visitors, and the safety of the collections, and it will be seen that quite a company of men is steadily, quietly, and efficiently engaged on behalf of the visitor, and the result is really a fine piece of team work.

There are, alas, many who think that exhibition galleries are

easily arranged and that to stick an object in a glass case is to make an exhibit. Working on these lines museum technique would be simple and, with such a staff as this Museum has and with so many acquisitions, the arrangement of exhibits should be quick and plentiful and the galleries should have kaleidoscopic change. Exhibition should dawn in fresh exhibition as night into morning, and if, like the passing of the night in the Elephant Scene in the Central Hall, this can be done by pressing a button the greater will be the sensation. But good museum technique is not accomplished in that way. The simplest exhibit may take a long time to prepare, just as a simple discovery may be of the greatest importance. Quick changes, even if sensational, are not necessarily of museum advantage. Quick returns are so often associated with small profits. Though to press a button and achieve an effect is attractive, especially to children, it may lead to knowledge only of how to press a button. More or less permanent exhibits should not be decried because they are so fixed, for most of the greatest truths are those that remain fixed through all the changes of philosophy and outlook.

But to return to the Works Staff, visitors who wish to see the results of their activity or efficiency do not need to see them at their work. "The proof of the pudding is in the eating"—not in seeing it made. If the exhibits are carefully examined, especially the later ones, and attention is paid to the carefully cut glass, the polished stands, the finely carved mahogany bases, the carefully worked iron supporting skeleton, shell or stone, even the untechnical can appreciate that these things are not the work of careless or uninterested men, but that the craftsman together with the preparator and the scientist produces a harmony the ultimate result of which is the Museum.

THE PIGMY ANTEATER.

Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

E Pigmy, or Two-toed Anteater, is a member of the Myrmecophagidae of the order Edentata. The Myrmeco-ıae, or Anteaters, are a group of Edentates in which no are developed, the body is clothed with hair, the mouth tubular and the tongue long, viscid and extensile. These animals feed exclusively upon animal diet, their chief food being ants and other insects. Three genera may be distinguished: (*a*) *Myrmecophaga*, including only the Great Anteater (*Myrmecophaga jubata*), a terrestrial animal; (*b*) *Tamandua*, the Tamandua Anteaters, of which a number of forms may be distinguished, all of which are arboreal, medium-sized animals with prehensile tails; and (*c*) *Cyclopes* (formerly known as *Cycloturus*), which contains the Pigmy, or Two-toed Anteaters. The latter agree with the Tamandua Anteaters in possessing a prehensile tail, but the skull is much shorter and is arched in a longitudinal direction. The specific name is "*didactylus*," and has reference to the two-toed appearance of the fore-feet, the third and second digits alone bearing claws, the third digit being much larger than the second. The fourth digit is represented only by the metacarpal and one nailless phalanx, and the first and fifth digits are represented only by very small metacarpals, the whole limb ing an ideal climbing organ. The hind-feet are also ially modified in the same manner, the great toe being e small and concealed beneath the skin and the other four armed with long, curved claws. The tail, which is bare he undersurface near the tip, is long and very prehensile, mbling the tail of the Tamandua Anteaters, except that the er surface of the terminal portion is covered with hair.

Pigmy Anteater.

At first glance these little anteaters would appear to bear e or no resemblance to their large terrestrial cousin, the

Great Anteater, but cranial characters show that they are undoubtedly members of the same family. Like the Tamandua Anteaters, they have developed special adaptations for their completely arboreal existence. It is difficult to understand how an animal modified in this fashion would fare if forced to leave the trees in which it makes its home, as the limbs are quite unsuitable for terrestrial progression, and a Cyclopes on the ground would probably be as badly handicapped as a Sloth.

In general dimensions these little anteaters are about the size of a rat and are clothed in very soft and silky coats; the latter are very beautiful in colour, being a kind of silvery-gold washed on the back with brownish-buff. The young pelage is more woolly and not so silky as in the adult. The range of distribution is confined to the forests of Central and South America.

The two specimens here illustrated are an adult and young individual, and were mounted in the Rowland Ward Studios. They are now on exhibition in the Lower Mammal Gallery, and are the gift of the Rowland Ward Trustees.

A "ROMAN" SNAIL IN THE MUSEUM GARDEN.

By G. C. Robson, M.A., Deputy Keeper, Department of Zoology.

In October 1931 one of the gardeners working in the Museum grounds discovered a living specimen of the "Roman" Snail, *Helix* (*Helicogena*) *pomatia*, meandering across a flower-bed near the railings on the north side of the West garden (adjoining Queen's Gate). It was a typically coloured adult apparently in the enjoyment of excellent health. The occurrence of this snail in a London garden is of some interest and calls for discussion.

The so-called Roman Snail is found sporadically over a considerable part of south-east England. Its metropolis seems, however, to be Surrey, and in particular the North Downs in the region of Box Hill, Epsom, and Dorking. The nearest place to London at which it occurs seems to be the Croydon–Sutton area, and it has never been recorded from London itself, unless we reckon some "introduced" specimens released at Wandsworth and Balham. Whether the North Downs are a focus of distribution from which it has been carried by man to

the more outlying parts of its distributional area, or whether the sporadic colonies found over a wider area are the relics of a denser and more continuous population is uncertain. As it seems to prefer limy soils, it is not likely to have had a wide extension off the chalk massif of south and east England. For our present purpose it is important to notice that there are plenty of records of its having been transplanted from place to place with the object of getting it to colonize new areas (*cf.* Taylor, "Monograph of the Land and Freshwater Mollusca of the British Isles," vol. 2, p. 230); and the question naturally arises: how did the specimen discussed in this article reach the Museum garden?

The specimen was a large one, measuring over 40 mm. in length and weighing 19 grams, and it is very improbable that it was accidentally transported by a bird, although fairly large snails (e.g. *Helix aspersa*) have been seen carried about in this way. The other possibilities are as follows:—

(*a*) It might have been accidentally introduced in packing material and found its way to the garden, *e.g.* from outside the taxidermists' buildings. Mr. J. R. le B. Tomlin informs me that he once found two specimens of the North African Desert Snail (*Eremina desertorum*) on some packing material that had fallen from a case that was being unloaded in the back premises.

(*b*) It is just conceivable that our *H. pomatia* might have been carried from Surrey or elsewhere on part of a vehicle which was "parked" either in the front or the back of the Museum. A smaller snail, *Cochlicella acuta*, was found by Mr. G. Rice on the mudguard of a car (*Journal of Conchology*, 1930, p. 26), at some distance from its distributional area. Neither of these suggestions (*a* and *b*) is very plausible, as they involve the escape of the snail from the back premises or the front "parking space" into the garden.

(*c*) The snail may have been brought directly into the garden with soil, turf, or plants.

(*d*) It might have been brought to the Museum for determination by a visitor who, disappointed at the commonness of his or her prize, crept away to the garden and deposited the now-despised object under the nearest bush.

(*e*) In the past there seems to have been a "craze" for experimenting in the transplantation of this species; it is possible that this has not entirely spent itself and that our *H. pomatia* may have been privileged to serve as the material for such an experiment. It is perhaps relevant to this suggestion to

mention that *H. pomatia* is one of the "domestic animals" of the zoological laboratory.

On the whole I am inclined to believe that it was intentionally introduced (either (*d*) or (*e*) above) or that it was accidentally imported in garden-material. I am indebted to T. Hay, Esq., Superintendent of Hyde Park, for the following information:— "The Snail may have been brought in with the manure during the Autumn period 1930–31. This farmyard manure is got from somewhere out Norwood way . . . or it may have gone down in the soil in which the plants are grown. This is also brought by us and is from some old Surrey pasture."

It may interest the reader to know that the name "Roman Snail" was based on a belief that *H. pomatia* was introduced into England from the Continent by the Romans. This belief was due to the frequent occurrence of the shell in Roman sites and occurrences of the living animal near the latter. It is quite clear, however, that it has been found in pre-Roman deposits.

A RARE DEEP-SEA ALCYONARIAN POLYP.

[By A. K. Totton, Assistant Keeper, Department of Zoology.

The size of an animal is for many people the common measure of its interest; and it is easy to understand how this feeling of awed interest must have been evoked in the heart of primitive man by the sight of large and savage animals. To-day we are no less interested in small and even passive creatures like the corals, anemones, and polyps, which latter include the subjects of this article.

We are indebted to the Eastern and Associated Telegraph Company for collecting these remarkable polyps off the cables. This cable company has already presented to the Museum much valuable material removed by their officers from cables under repair from time to time. Only once before has a specimen of *Bathyalcyon* been seen, and that was fished up by the famous Dutch "Siboga" expedition in 1899 from a depth of 924 metres (500 fathoms) in the Malay Archipelago, east of Ceram. The cables to which the present specimens were attached were raised, the one from a depth of 400 fathoms in the Malay Archipelago, and the other from 150 fathoms in the Philippine Islands.

Like so many other deep-sea animals, the polyps are coloured deep-red. This is less pronounced in the case of the Philippine specimen, which was living in shallower water.

Alcyonaria are lowly organized animals, and include such well-known forms as the precious red coral, the soft and com-

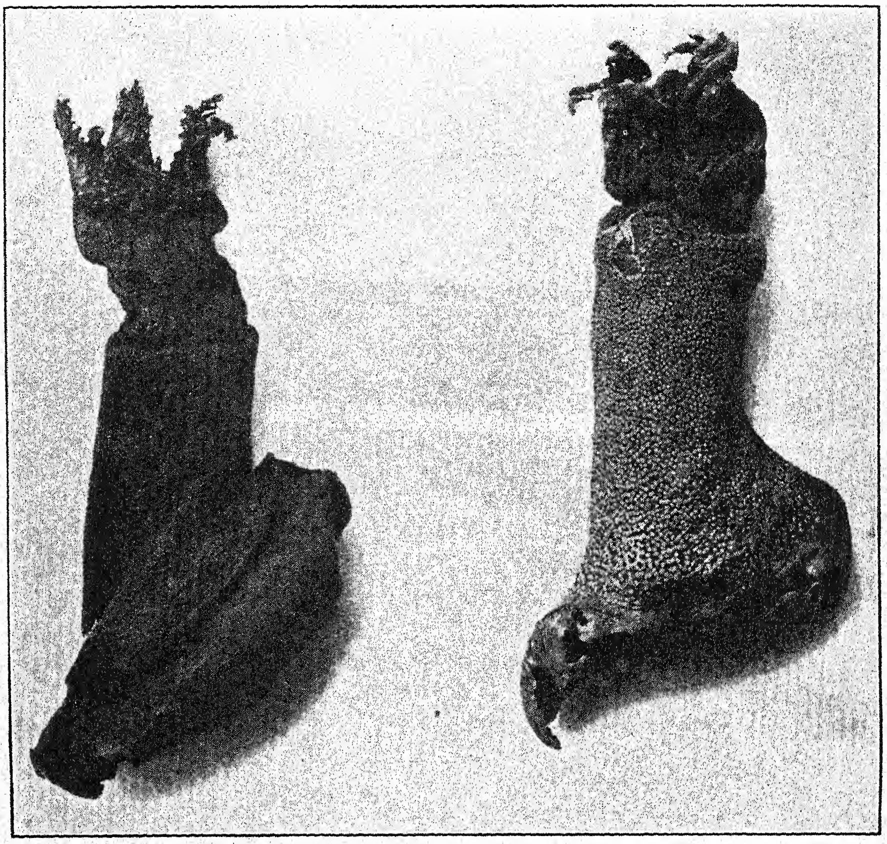

FIG. 1.—*BATHYALCYON ROBUSTUM*, VERSLUYS.

The dark-red Malay specimen on the left from 400 fathoms shows the eight pinnate tentacles, characteristic of Alcyonarian polyps, and the naked basal area, which may be compared with the stalk of *Anthomastus* (Fig. 2). On the right may be seen more clearly the small respiratory sexual polyps covering the column wall of the paler Philippine specimen from 150 fathoms.

paratively spongy Dead Men's fingers, Sea-pens, and flexible corals or Gorgonians. The significant thing about them and the reef corals, anemones, and most jellyfish is that they are sac-like animals, which have never progressed in bodily form much beyond a certain stage through which the more highly organized animals such as ourselves pass at a quite early stage

of development from the egg. They are all, so far as we know, specialized carnivores, and feed on comparatively small animals, captured and paralysed with their armed tentacles. Whilst the reef corals usually have a solid limy skeleton, *Bathyalcyon* and its nearer allies are protected by layers of separate limy particles or spicules of complicated, yet characteristic, shapes embedded in the flesh.

The particular point of interest about *Bathyalcyon* is that, though at first sight it appears to be a single giant polyp, twice as large as the largest of Alcyonarian polyps hitherto known, closer examination shows that its column-wall is covered with innumerable small respiratory and sexual polyps that have lost all traces of tentacles. It thus differs from *Alcyonium* and its allies in having polyps of two kinds. But it is instructive to compare the colony with those less-specialized dimorphic forms like the species of *Anthomastus*, in which the animal resembles a mushroom. In them there is a supporting stalk and a large expanded top, bearing not one, but a large number of feeding polyps or autozooids, separated one from another by innumerable small, reduced, respiratory or sexual polyps called siphonozooids. It looks very much as if *Bathyalcyon* has evolved by a reduction in the number of autozooids, accompanied by great increase in the size of the only one that remains.

FIG. 2.—*ANTHOMASTUS* SP., FROM 150 FATHOMS, PHILIPPINE ISLANDS.

The small respiratory polyps or siphonozooids can be seen between the larger retracted feeding polyps or autozooids on the head of the pale-red mushroom-shaped polyp-aggregate.

BOOK NOTICES.

ion to Zoology. By Zeno Payne Metcalf, D.Sc. Pp. xix + 1 184 figures and 5 diagrams. (London: Baillière, Tindall & 2. 20s.)

lume Dr. Z. P. Metcalf selects the rat as his special type around ve a general introduction to Zoology. The work is divided into he first of which consists of two short introductory chapters on of Zoology" and "The Animal Kingdom." In the first of these between the Physical World and the Biological World is dealt ollows a short account of the division of the latter into Animal le Kingdoms. A diagram is given of the different metabolism of plants, and the difficulty of distinguishing the two groups is noted, connection, reference is made to the possibility of creating a third *rotista.* It is to be hoped that we have heard of the *Protista* for the

nd chapter, devoted to the classification of the Animal Kingdom, ictorial chart designed to show the main differences between the l the Metazoa and the chief divisions of the latter. The classification lern one, but doubtless will suffice for the purpose of this "Intro- The statement that the young of the mammalia "are born in a fairly ate of development" requires some modification when the mar- aken into account; it would have been more satisfactory if the word had been inserted between the words "are" and "born." deals with the general morphology and physiology of the rat, with chapter on the structure of animal tissues, followed by another on nd natural history of the rat. It seems a matter for regret that this ıld still be referred to the genus *Mus*: surely *Rattus* is now in use world! The external characters are compared with those of other , and in this section we read that "in the squirrels and squirrel- d mammals, the tail is used as parachute to aid them in their long nd then follows: "The fox uses its tail in a similar way." This isleading to the student unfamiliar with the vulpine habits. are chapters on the integumentary, muscular, skeletal, digestive, , urinary, circulatory, reproductive and nervous systems, and a well- tion entitled "Locomotion in Animals." The author seems a little bout his "creeping animals," whether to call them "Reptatorial" torial." Perhaps "creeping" is as good a word as can be found for nals, especially as we already have met with, in this chapter, the divisions of locomotion: ambulatorial, cursorial, saltatorial, scan- sorial, aerial, fossorial and natatorial; however, there are some who r to call a spade a spade and use the words walking, running, jumping, gliding, flying, burrowing and swimming or aquatic. hapters entitled "Metabolism," "Heredity," "Embryology" and Behaviour" are all interesting reading, and the last of these is followed III, which deals with "Philosophical Zoology." The first subject nder this heading is that of "Distributional Zoology," stress being e "life-zones" of Merriam. Then follows a chapter on "Palaeonto- e on "Organic Evolution" and a concluding chapter entitled "The f Zoology." In the latter is an unusual portrait of Charles Darwin, him clean-shaven except for "mutton-chop" whiskers. nly serious criticism than can be made is that the paper the book is n is not good enough for a work of this character and some of the ons are weak and serve no useful purpose. The subject-matter,

however, is set forth in an attractive and entertaining manner and, although one would hesitate to replace any of our standard text-books with this volume, it will certainly be appreciated, and should be carefully read by students of zoology.

Economic Mammalogy. By JUNIUS HENDERSON and ELBERTA L. CRAIG. Pp. x + 397. (London: Baillière, Tindall & Cox, 1932. 26*s*.)

THE authors of this volume, Junius Henderson and Elberta Craig, manage to compress into about 400 pages the chief facts appertaining to Economic Mammalogy. In nearly every subject dealt with they have been successful in gathering together a mass of interesting detail, and the book should be of interest to all students of Mammalogy. Early chapters deal with "The Balance of Nature," "Mammals as a Source of Human Food," and "Mammals as a Source of Valuable Products other than Food." In the latter we once again learn what appalling destruction has, in the past, been allowed to go on in the whaling industry, and no less disturbing figures are given in a later chapter entitled "The Fur, Leather and Hide Trade." In this chapter there are given figures, originally quoted by Osborn and Anthony, which are eloquent evidence of the immense drain made upon fur-bearing animals. In the three years 1919–1921 it was calculated that 23,000,000 mole, 14,000,000 squirrel, 14,000,000 musk-rat, 9,000,000 American opossum, 6,000,000 skunk and many more millions of other skins appeared on the market. We may be willing to spare a few million musk-rats at the present time, but such wholesale destruction as these figures prove can have but one result—extinction.

The chapter dealing with disease carried by mammals should be of interest to many, including lovers of the domesticated cat. This animal is named as being one of the chief agents for the distribution of ringworm, and it is further stated to be a carrier of creeping eruptions. Much of this chapter is filled with facts concerning rabies, tularemia (or rabbit-fever) and bubonic plague; as the volume has admittedly mostly to do with North American mammals, the fact that sleeping sickness is referred to in one line is not, perhaps, a matter for comment.

In a chapter dealing with animals dangerous to man one learns that in the year 1910, in India alone, wild mammals were responsible for the deaths of 2,138 persons. Of this number nearly half were accounted for by tigers; leopards, wolves and bears together making a good second. Protection of useful mammals and control of injurious species are other subjects discussed at some length and make interesting reading.

The second part of this book deals with the economic question from the systematic stand-point; as might be expected the Rodentia occupy the largest part of this section. Considerable space, however, is taken up by the Ungulata and Carnivora, and many of the economic problems pertaining to these groups are gone into in considerable detail.

A fascinating volume and one that should be read widely, as it appeals not only to the worker on mammals, the fauna protectionist, and the student of economics, but also to the "man in the street."

Northward Ho!—for Birds. By Ralph Chislett. Pp. xvi + 188, with 87 figures (1 map and 86 figures on 44 plates). London: Country Life Ltd. 1933. 15*s*.)

THE photographing of birds and their nests is a hobby engaged in by many amateur photographers of both sexes, who, however, for the most part confine their attention to species nesting in the British Isles. In the present work Mr.

Chislett has not been content with birds breeding in this country, but has followed some of our winter visitors to their summer quarters in more northern climes.

The first ten chapters are devoted to the moorland birds of Derbyshire, Galloway, the north of Scotland, and Shetland, and all are illustrated with admirable photographs. But so many books and articles have been written on the same subject that it is almost with relief we turn to the remaining chapters on the author's excursions overseas.

The first country visited was the island of Öland, in the Baltic, where he studied ruffs, black-tailed godwits, and black terns, all birds which formerly bred in East Anglia. The next trip was to Lapland, and here many of our less common birds, such as blue-throats, long-tailed skua, and broad-billed sandpiper, engaged Mr. Chislett's skill, as well as other more familiar species: fieldfares, redwings, and jack snipe. Of the last he has some interesting remarks on the so-called "love song," but is unable to suggest how it is produced.

The author is a very skilled photographer, and his pictures are among the best we have seen, especially the four studies of blue-throats, showing clearly the characteristic markings and form—indeed, everything except colour, of these delightful birds. Mr. Chislett writes in a pleasing style and has interesting observations on the different birds met with. His final chapter should be read by all bird photographers, especially the last paragraph on p. 178. "Photographers can claim to be harmless only if they discriminate and exercise care. I ask my fellow-workers to exercise that care, to be jealous for the welfare of the wild life they study; remembering that no matter how excellent their work, it is of secondary importance to the preservation of a priceless national possession, which once destroyed cannot be replaced; to do not a thing to mar the amenities of the places in which they are privileged to work, and so to preserve the good name of those who follow a great pursuit. . . ."

Modern Theories of Development. An introduction to theoretical biology. By LUDWIG VON BERTALANFFY. Translated and adapted by J. H. WOODGER. Pp. x + 204. (Oxford University Press; London: Humphrey Milford, 1933. 8*s.* 6*d.*)

THE extraordinary progress in theoretical physics which the twentieth century has witnessed has no counterpart in biology. Except in the field of genetics, which is logically the most advanced of biological studies, biological knowledge at present consists of a structureless mass of observations and experiments, to which new facts are daily and almost hourly being added, and of recent years there has been on the Continent and especially in Germany a growing consciousness of the need for principles of synthesis to unify and explain this unwieldy aggregation of empirical data. The interpretations derived from the great biological theories of the nineteenth century—mechanism, vitalism, Natural Selection, Lamarckism, etc.—which were regarded as established biological territory, are now scarcely more assured than the earlier phylogenies; and to-day it is not so much that it is impossible to see the wood for the trees as that biology is all trees and no wood.

This is what von Bertalanffy means by the present crisis in biology, and the first part of his book is devoted to a plea for a concerted effort to create a theoretical biology which shall bear the same relation to descriptive and experimental biology as theoretical physics does to empirical physics. The movement of which the author is a spokesman proceeds from a growing realization of the limitations of the inductive method; and the first step in the desired direction must be a thorough logical overhauling of the current biological theories and their concepts. The author has little difficulty in showing the

inadequacy of additive mechanism and the machine theory as modes of interpretation of life, for the assumption that the analysis of vital processes into an indefinite number of separate causal chains of physico-chemical events will yield organism is no longer tenable. The inorganic can be added to the inorganic to infinity and it will never reach organism, for they belong to different orders of reality. Vitalism, on the other hand, while it has done good service in bringing to light the inadequacy of mechanism, has *qua* scientific theory this cardinal weakness, that it postulates the presence of preternatural entities at work in the organism and so puts it ultimately outside the reach of scientific investigation.

Von Bertalanffy believes that the solution is to be found in the teleological or organismic theory. This theory, which has been for many years developed and defended by J. S. Haldane in this country, sees the essential principle of life in the coordination of the various organic parts and processes, in their coherence and their active maintenance as an integral unity expressed in the structure and activity of the organism. Many objections have been raised to this point of view. The instinctive response of many scientific men to any mode of interpretation other than the mechanistic is to start a kind of witch-hunt for what they call mysticism, when they mean obscurantism. Moreover, teleology is treated with the gravest suspicion, and the opponents of the organismic theory claim that to regard the organic processes as being directed to the maintenance of the organism as a whole means the assumption of some mysterious anthropomorphic activity. The fallacy of this criticism lies in the raising of the purposiveness of the organism to the psychological level. Actually for the purposes of biology the whole-making principle of the organism is quite free from hypothesis, whatever its implications may be for theology or metaphysics; and it cannot be over-emphasized that in organismic teleology nothing mental is presupposed.

Again, there is a school who while they have abandoned the old materialistic monism on philosophical grounds remain methodological mechanists, that is to say, they insist that the principles and hypotheses employed in physics are the only possible ones for the purposes of science, and that therefore biology and physics must eventually become one discipline. For most of this school the mathematical study of phenomena is the only one worthy of the name of science. In this relation Bavink's comment on the views and criticisms put forward by von Bertalanffy is worth quoting. "In my opinion they finally and irrefutably dispose of the fatal error, which has injured an epoch of scientific thinking, of equating science in general with mathematical physics. . . . Science is an attempt to bring facts into logical order. Mathematical physics is only one special aspect of this activity."

Organic history and teleology are facts in spite of all the efforts of mechanists to prove the contrary, and as such science must take account of them. It may be a pity that certain aspects of reality do not accord with an epistemological dogma, but this is scarcely a reason for ignoring them or abandoning their investigation. Needham in this country has drawn from the demonstration of *Gestalten*, or integrated configurations, in the inorganic realm the conclusion that the autonomy of biology can no longer be based upon organic wholeness, and that the *Gestalt* point of view renders possible the reduction of biology into physics and chemistry. Needham's conclusion implies that in the nature of its wholeness a physical *Gestalt* is strictly comparable with an organism. This is a very questionable assumption, for there is no evidence that either organic history or organic development has an analogue in the inorganic world. In von Bertalanffy's words: "But this great wonder, the raising of the level of organization, the accumulation and evolution of faculties, etc., is given by no

crystal or chemical system. It is not that there is wholeness in the organic realm in general which is decisive, for such is also exhibited by inorganic systems, but the *kind* of totality—the *developing* totality."

The second part of the book is devoted to a critical review of all the current theories of development and to the successful interpretation of the results of recent embryological investigation in the light of the organismic theory. After reading the author's review of the modern researches in embryology, one is left with the impression that the procedure in nearly all cases is the same. The investigator selects a developing egg, usually that of an amphibian, and performs upon it a carefully calculated mutilation, often of an ingenuity to rival that of Heath Robinson, watches what happens, and interprets the result in the light of his preconceived notions of the nature of the organism.

Of the book as a whole it may be said that it should undoubtedly be read by all those who are interested in the probable lines that biology will follow in the immediate future.

MUSEUM NEWS.

Mr. Alfred Cecil Wray retired from the Museum service on June 20, 1933. He began duty in the office on July 11, 1887, and was promoted to be Higher Grade Clerk on April 1, 1922. He was responsible, among other duties, for seeing to the shipping traffic from and to the Museum, and for dealing with matters relating to expeditions. He was Treasurer of the Museum branch of the National Savings Association from 1927 until his retirement.

Mr. Charles Christopher Milan was promoted on June 21, 1933, to the Higher Grade Clerkship in the Office vacated by Mr. Wray. He joined the Museum staff on August 15, 1910, and prior to his transference to the Office in 1921 served in the Library of the Department of Zoology.

* * * * * * * *

In his will Mr. B. H. Soulsby, who died on January 14 (this vol., p. 76), bequeathed, free of all death duties, "To Alexander Cockburn Townsend, M.A., Librarian of the British Museum (Natural History), such of the books in my possession at the time of my death that he may select, and the remainder of such books (exclusive of the Linnean printed matter and manuscripts hereinafter mentioned) to the University of Reading as an addition to the Library thereof. . . . And it is my desire that the said Alexander Cockburn Townsend shall be requested to sort my papers in my room at 'Mentmore' (or at such other place as I may be living at the time of my death) and to select for the British Museum (Natural History) all Linnean printed matter and manuscripts which he may care to possess, and I give and bequeath the same accordingly, and I request that the said Alexander Cockburn Townsend shall destroy any other papers." Elsewhere in the will he refers to the "Collection of the Works of Linnaeus in the British Museum (Natural History), now the second finest collection in the whole world (after that at Upsala), on which I have expended nearly one thousand pounds."

ACQUISITIONS.

Department of Zoology.

Series of skulls of a small race of elephant from the Gola Forest, Sierra Leone; presented by His Excellency the Governor of Sierra Leone.

Mounted specimen of a Sussex fowl and a pair of abnormal (markedly palmated) antlers of a samban; presented by the Rowland Ward Trustees.

Collection of North American ungulate heads shot by the late Mr. Flemming Crooks; presented by Lady Taylor, Mr. J. Kirke Crooks, and Mr. A. Crooks.

Mounted specimen of snow leopard shot by the late Col. Stephen Frewen in Ladak in 1896; presented by Lieut.-Col. L. Frewen.

Mounted specimen of curly-coated retriever; presented by Mr. B. Hawes.

Mounted specimen of the "Blue Beveren" breed of rabbit; presented by the National Beveren Club.

Two specimens of a rare East African scaly-tail; presented by Mr. R. E. Moreau.

Series of stereoscopic radiographs of mollusc shells for exhibition; presented by Dr. G. H. Rodman.

Collection of 668 birds, representing 250 species, from South Africa, mostly from eastern Natal; purchased.

Department of Entomology.

An important collection, numbering about 40,000 specimens, of Coleoptera belonging to the family Curculionidae; deposited on permanent loan by the Hawaian Sugar-planters' Association, Honolulu.

The collection of insects, mainly butterflies, moths, and beetles from Brazil, made by the donor's brother, the late E. D. Reynolds; presented by Miss Jean Reynolds.

Department of Geology.

Large collection, mainly of Silurian fossils from England and Norway; presented by Miss M. S. Johnston.

Large collection of fossil invertebrates, mostly Silurian coelenterates and brachiopods from England and Scandinavia; presented by Miss M. C. Crosfield.

Department of Mineralogy.

Portion of a meteoric stone which fell on July 8, 1932 at Kahrapar, Jaunpur, United Provinces, India; presented by Mr. H. Minson, Collector of Jaunpur.

Wind-worn lump of clear, transparent, pale yellowish-green silica-glass, resembling bottle-glass, from the Libyan Desert; presented by the Survey of Egypt.

Native Indian pair of scales for weighing gem-stones, with sets of weights of agate and seeds; presented by Mr. E. Hopkins.

Department of Botany.

Herbarium of about 20,000 specimens, including 6000 Charophyta and 11,000 British flowering plants, mosses, and sea-weeds; bequeathed by Mr. James Groves.

Collection of over 1,200 Mesopotamian plants made by the donor and others while on active service; presented by Dr. R. J. D. Graham.

Collection of about 900 specimens of plants made by Mr. A. W. Exell, Assistant Keeper, in company with Mr. W. H. T. Tams, Assistant Keeper, Department of Entomology, in the islands of the Gulf of Guinea; the cost was met by grants from the Percy Sladen Trustees and the Godman Exploration Fund.

British herbarium, of about 6000 specimens, formed by the donor's father, the late C. A. Wright, presented by Miss I. M. Wright.

Plants collected in the West Indies, presented by Dr. A. B. Rendle, F.R.S.

OBITUARY.

BARON NOPCSA.

The sudden death of Franz, Baron Nopcsa, Ph.D., in Vienna on April 25, when he was within but a few days of his fifty-sixth birthday, has deprived geological science, and particularly palæontology, of one of its most distinguished followers. He was recognized as one of the leading vertebrate palæontologists and much of his work on fossil reptiles bears the stamp of genius. Although hampered by severe illness since the end of the War, he never abandoned his researches nor lost interest in his work. For some years he was Director of the Geological Survey of Hungary and of the Museum associated with it. At the time of his death he was a Foreign Member of the Geological Society of London and a Corresponding Member of the Zoological Society. Throughout his life he was keenly interested in the British Museum (Natural History) and paid it many visits, during which he seldom failed to make some additions to the Library or the Collections. His important collection of fossil reptiles was purchased by the Trustees in 1923. In 1926 he spent some time working in the Geological Department and described the Canadian armoured dinosaur now known by his name of *Scolosaurus cutleri*. His last visit was for a fortnight in February 1931, when the accompanying photograph was taken by Col. W. P. C. Tenison.

Baron Nopcsa.

A man of tremendous energy, it is only natural that he should have had his detractors, and that, having a large scientific output, he should have made occasional mistakes; but his many Museum friends will remember him for his wide culture, for his pleasant and courtly manner, and for his conversation, always witty and charged with stimulating ideas.

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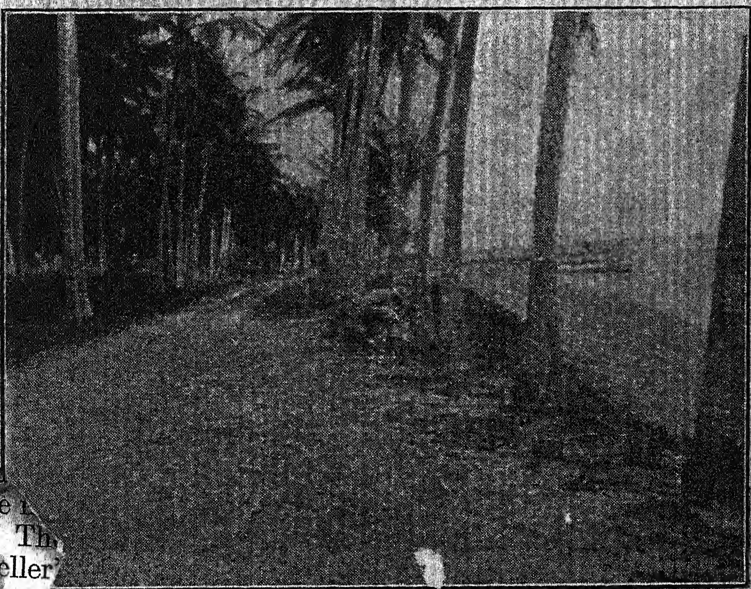
NATURAL HISTORY MAGAZINE



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DUGONGS FROM MAFIA ISLAND AND A MANATEE FROM NIGERIA.

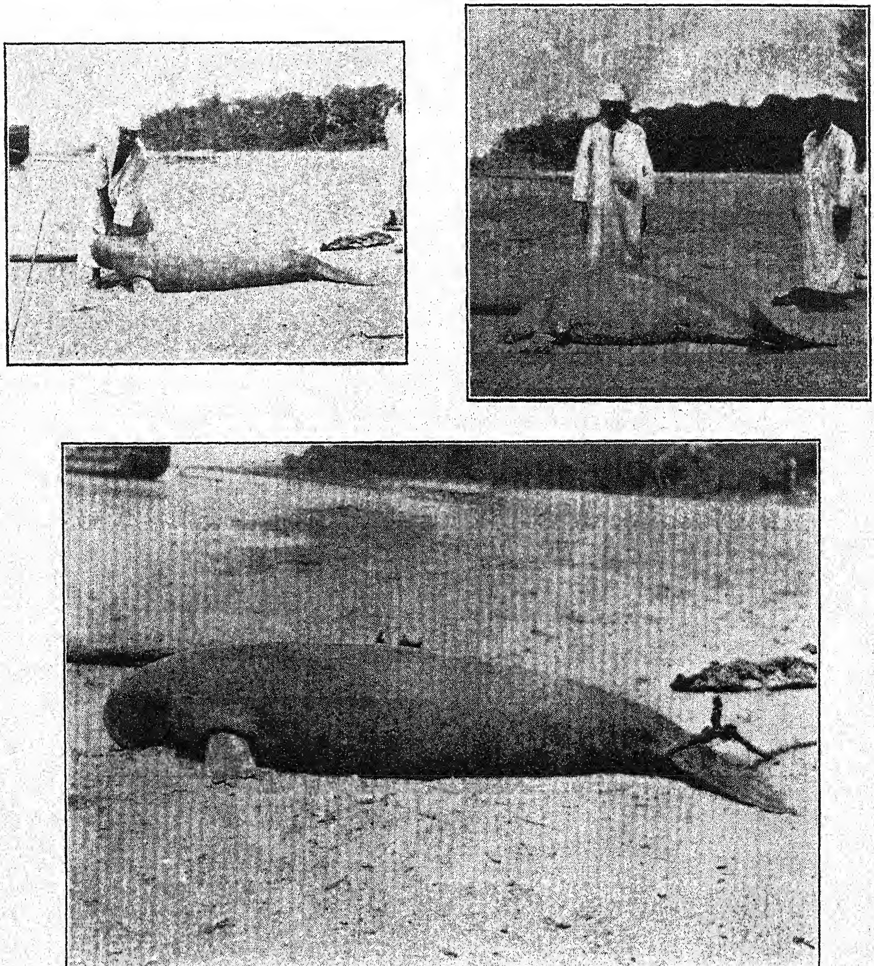
By GUY DOLLMAN, B.A., Assistant Keeper, Department of Zoology.

THE Museum has recently received as a donation from Mr. B. W. Savory two complete skulls and a lower jaw of the Dugong from Mafia Island, Zanzibar Archipelago. These skulls were obtained from dugongs netted by native fishermen at Kilindoni, Mafia Island, in the latter part of 1930. Photographs of these dugongs were taken by Mr. Savory, and three of them are here published for the first time (Figs. 1–3).

The dugongs, together with the manatees and Steller's sea-cow, comprise, with the fossil forms, the order Sirenia. Sirenians, or sea-cows, are exclusively aquatic, inhabiting coastal waters and rivers. In shape these animals conform to the typical aquatic outline, the body being more or less fish-shaped, the fore-limbs being modified to form flippers, the tail flattened like that of a whale, and, externally, there are no hind-limbs. The nostrils are placed on top of the head, and both the eyes and the ears are small, there being no external ear developed. The bones of the skeleton are extremely dense and heavy; there are no collar-bones, and the pelvis is quite small and vestigial.

The three types of Sirenians, the dugong, the manatee, and Steller's sea-cow, are regarded as representing three family groups, the Halicoridae, the Trichechidae (formerly Manatidae) and the Hydrodamalidae (formerly Rhytinidae) respectively. The dugong (*Halicore*) is an inhabitant of shallow seas and coastal rivers between north-west Australia and the Red Sea. The nostrils are more elevated than in the manatee and nasal bones are not developed. There are seven cervical vertebrae, nails are not developed on the flippers and the tail is notched in the mid-line and pointed laterally. The manatee (*Trichechus*) is an inhabitant of the coastal rivers of eastern tropical America and western tropical Africa. The nostrils are not so elevated as in the dugong, and nasal bones are developed. There are six cervical vertebrae, nails are usually present on the flippers, and

the tail has no central notch, being rounded and shovel-shaped. Steller's sea-cow (*Hydrodamalis*) was formerly an inhabitant of the waters around Behring Island and Copper Island in the north Pacific. In the adult specimens of Steller's sea-cow there are no teeth, their place being taken by horny plates. The



FIGS. 1–3.—DUGONG, TAKEN AT MAFIA ISLAND BY MR. B. W. SAVORY.

number of cervical vertebrae in this animal numbered seven, the flippers were relatively small, and the tail had two lateral, pointed lobes. Further, the head was small compared with the large size of the body, this species being by far the largest member of the order, sometimes reaching a length of 25 feet. It was

discovered by Behring and Steller when they were wrecked upon Behring Island in 1741, and was supposed to have become extinct in 1768. Its extermination was brought about by Russian traders, and its final extinction was accelerated by its large size, slow movements, and fearlessness of man.

Sirenians would appear to use the tail exclusively when swimming, the flippers being used for feeding purposes. These animals appear to pass the whole of their lives in the water, their food consisting entirely of aquatic plants, upon which they feed while beneath the surface. The dugong has a habit of raising its head out of the water, and this habit has possibly given rise to the legends concerning mermaids. The so-called mermaids which are exhibited at places of amusement at Aden and elsewhere are nearly always either combinations of monkeys and fishes or else dugongs which have been doctored so as to make them as human-looking as possible. This is arrived at, as a rule, by blocking up the apertures of the ears, eyes, and nostrils, and building up a new face on the muzzle or disc. These fakes are sometimes very cleverly carried out, and it is almost impossible to detect the true position of the animal's eyes, ears, and nostrils. As a rule, the bristles of the muzzle are removed and the human effect is heightened by the insertion of glass eyes into the artificially constructed eye-sockets. The flippers are sometimes skinned so as to show the skeleton, thus producing a somewhat human-like hand which adds considerably to the general effect of the faked specimen.

The disc or muzzle is divided into two halves by a vertical cleft, and the lower portion is covered with short, blunt spines. Above this area are a number of longer and finer bristles, possibly of a sensory nature. The nostrils, which are situated outside the disc on the top of the head, are crescentic in shape and apparently retractile. The eyes are small, deeply-set, and black in colour, and the ear aperture is quite minute, being less than half an inch in diameter.

Mr. Savory's two skulls are those of an old male (Fig. 4) and an adult female dugong (Fig. 5). The tusks in the male sex, when the animal is adult, are large and massive teeth, extending well out beyond the alveolar border. These tusks represent the second upper incisors, and are comparable to the tusks of an elephant. The first pair of incisors, which remain quite small, are shed early in life, and their alveolar cavities are encroached upon by the large second incisors, which have persistent pulps and bevelled cutting edges. In the female sex the tusks are retarded in their growth and never emerge beyond the gum, remaining

hidden in the alveolar tissue throughout life; in this respect these Sirenians resemble some Indian elephants in which the tusks in the females never grow beyond the alveolar border.

Another resemblance to the Proboscidea is to be found in the method of succession of the molar teeth, this being more horizontal than vertical. The first three cheek-teeth are shed one after another, leaving the hinder pair only in old age. Occasionally six cheek-teeth are developed on each side of each jaw. The teeth are roughly circular in section except the last molar, which, as it wears away, gets more and more bi-lobed, until finally, in

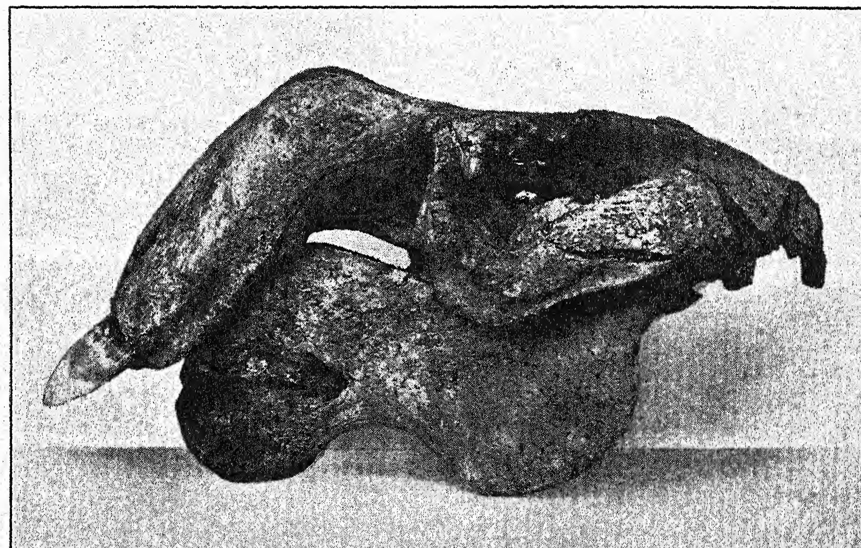


Fig. 4.—Skull of Male Dugong (lateral view).
Length 15 ins.

old animals, this tooth presents a figure of 8-like section, the tuberculate surface of the young tooth being worn right away and the tooth becoming a bi-lobed, flat-surfaced grinder.

The grinders in the lower jaw are of similar form, and succeed each other in a similar manner to those of the upper jaw. In front of the lower jaw there may be observed four alveolar pits in each half of the jaw (Fig. 6), which in early life accommodated the lower incisors or incisor and canine teeth. These teeth would appear to be quite functionless, since throughout their existence they are hidden away below the horny plate which covers the lower jaw, and are absorbed at an early age. These alveolar cavities would then seem to take upon themselves the function of

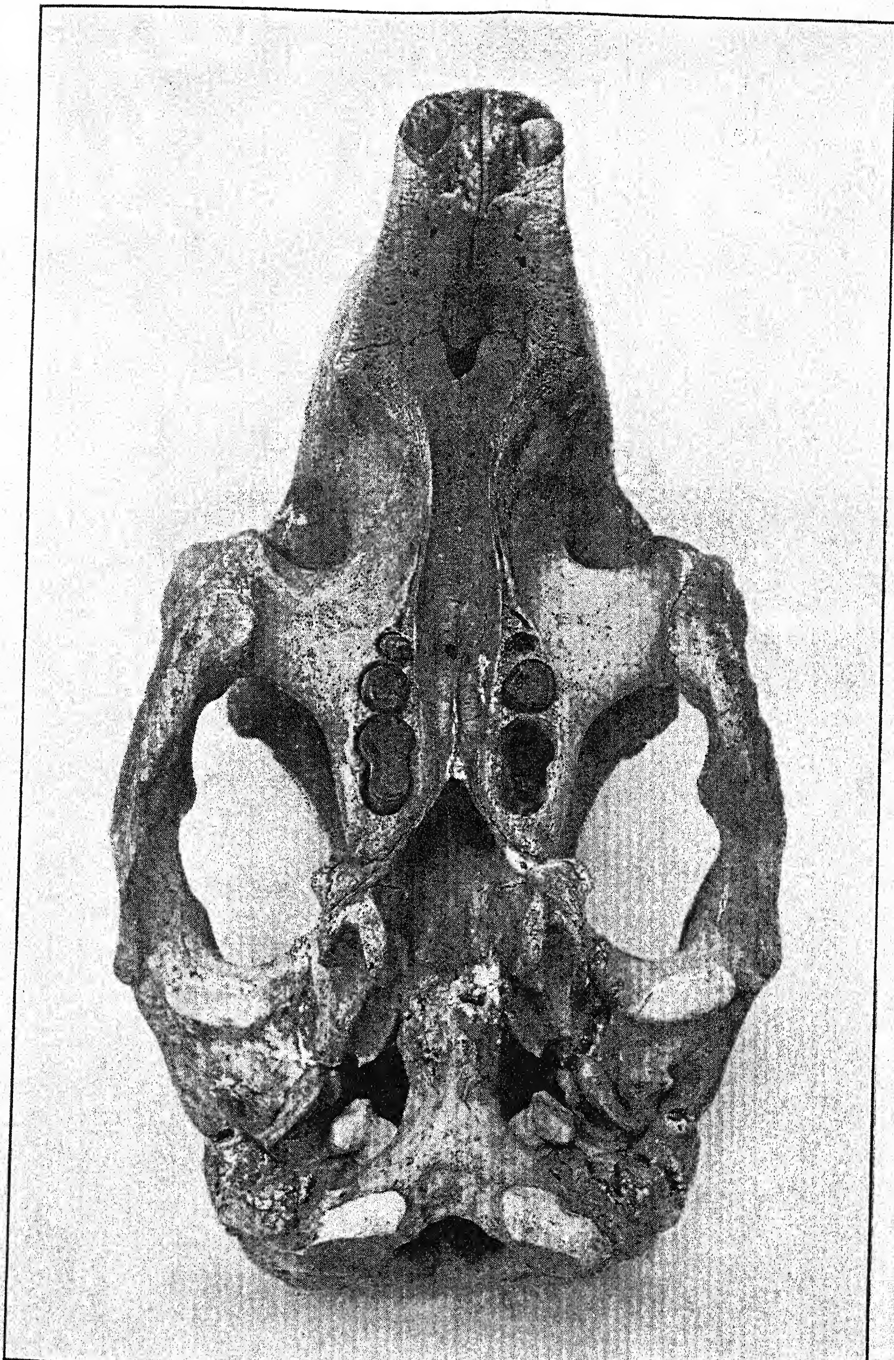


FIG. 5.—SKULL OF FEMALE DUGONG (VENTRAL VIEW).
Length 15 ins.

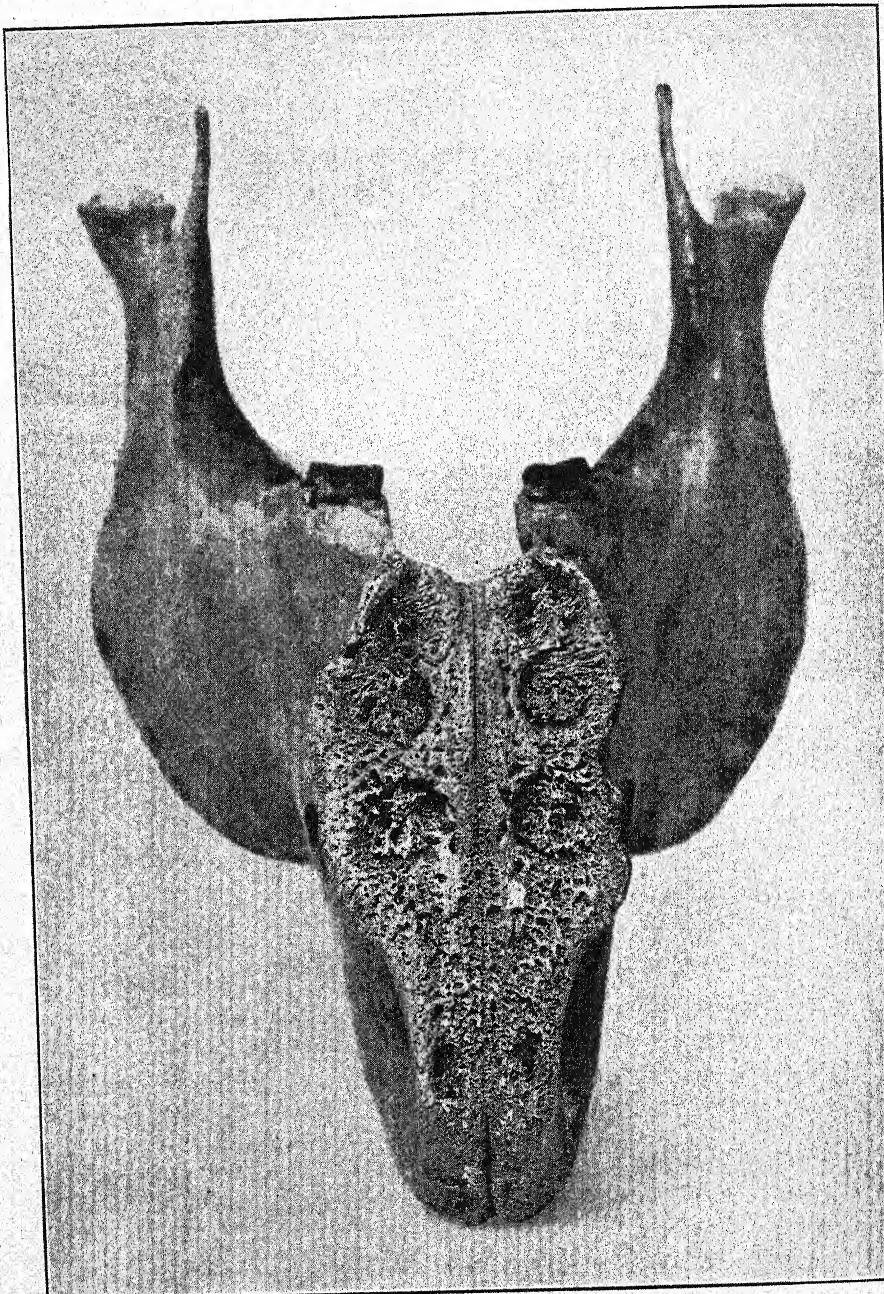


Fig. 6.—Lower Jaw of Dugong, showing alveolar cavities of functionless front teeth.

Extreme length 12 ins.

anchoring this plate to the lower jaw, as ligaments have been observed extending from the cavities into the tissue of the plate.

Mr. Savory reports that he gathered from the natives that the dugong swims in about eight fathoms of water, and he expresses surprise that such a helpless creature can survive in the shark-infested waters surrounding Mafia Island. The flesh is said to be superior in flavour to the usual East African beef and finds a ready sale locally. The largest dugong captured round the island measured 10 feet 2 inches in length, the measurement being taken from the anterior points of the tusks to the notch of the tail in a straight line. The intestines of this specimen were extremely long, measuring some 132 feet in length. In two specimens recorded by Owen this measurement is given as 115 and 101 feet. Mr. Savory in his notes upon these animals remarks that they are probably more common around Mafia Island than anywhere else in East Africa, and that they are usually caught during the monsoon. Mr. Boden Kloss, in a paper published in 1905 on the dugong, reports that in the Gulf of Manaar the dugong would appear to be changing its habits to a certain extent, as it has ceased to frequent shallow waters except when wounded or sick. The same author reports that off the coast of Queensland the dugong is found in water of from 10 to 12 fathoms.

A manatee (Fig. 7) was recently presented to the Museum by Mr. F. J. Woods, who collected it in the Izichi river, Anambra Creek, Southern Province of Northern Nigeria, on November 12, 1932. This specimen measured in total length (straight line) 11 feet and had a girth of 7 feet 5 inches. It was reported to be elephant-grey in colour, the body being very sparsely covered with black hairs; the whiskers and eye-lashes were black. The specimen bore two scars on its body which were probably the results of old spear-thrusts; the natives maintain that crocodiles never attack these animals. A thick layer of fat was found to be directly underneath the skin, and in the middle portion of the body this layer is said to have been four times as thick as the muscles. The flesh has the appearance of pork, and tastes rather like a mixture of pork and veal.

Hunting the manatee in this portion of Nigeria is a regular occupation, and the manatee-hunter follows no other trade. The work is carried out at night, and usually the animals are attracted by a bait of grass and then speared when taking the bait, their position being indicated to the hunter by the movements of saplings stuck into the mud and forming a semi-circle round the bait. The spear has a stout, barbed, detachable head attached by a long rope to a thick shaft, to the other end of which

is fixed a large piece of wood which serves both for weighting the spear and as a visible float after a successful throw. The shaft quickly becomes loose from the firmly embedded head and rises to the surface as the rope unwinds, and is watched and followed by the hunter until the animal is so exhausted that it can be drawn to the bank and given a final stab. This is usually deferred until after daybreak, or until the beast is *in extremis*, as great havoc can be wrought to both canoes and men by these animals' powerful flippers and tails.

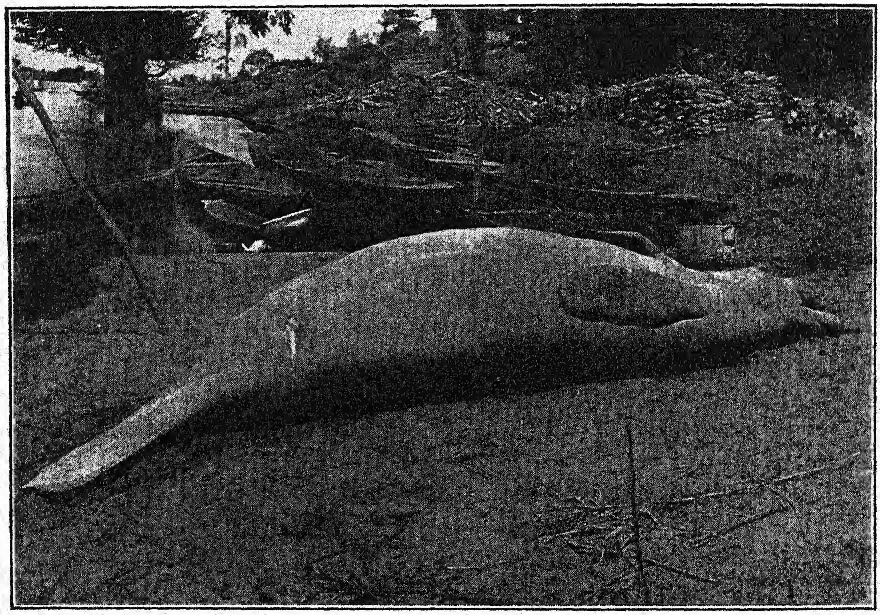


Fig. 7.—Manatee.
Specimen and photograph presented by Mr. F. J. Woods.

One manatee a month is considered good hunting, and as the "beef" of a single beast realises from £5 to £8, the occupation of the manatee-hunter is undoubtedly remunerative. According to the natives, manatees feed only on grass, but Mr. Woods reports having seen them several miles inside the flooded area of the Anam forests, where grass is non-existent or very scarce. It seems possible that they browse during these flooded periods when they have the run of the forests to themselves. It would appear that these animals can remain under the surface of the water for quite a lengthy period; the natives believe that they can remain under indefinitely. When conditions permit, the manatees

delight to remain on the surface, but when danger threatens they immediately submerge.

Mr. Woods in his report on this animal states that to many tribes the manatee is "ju-ju." The Abos believe that it is certain death even to see one, and the same belief seems to exist amongst the Asaba and other tribes inhabiting the banks of the Niger. All the regular hunters of the manatee would appear to be Haussas, and when a carcase of one is being towed in, a warning drum commences to beat a special rhythm, which continues until the beast has been cut up. If killed at a distance or after a prolonged struggle, it sometimes happens that it is evening before the body arrives at the bank of the river, and then it is necessary for the drumming to continue all night until the carcase is cut up the next morning.

Manatees would appear to be commoner in Nigeria than is usually thought to be the case. They are known to occur in the Niger, and are probably also numerous in most of the other large rivers in Southern Nigeria. There seems to be little fear of this species being killed off in the near future, since firearms have been found to be useless against it, and the methods of hunting and killing must remain the same as those which have been used from time immemorial.

A VISIT TO THE ISLANDS IN THE GULF OF GUINEA.

By W. H. T. Tams, Assistant Keeper, Department of Entomology.

The fact that we are natives of a group of islands does not seem to have lessened in any way our interest in the other islands of the world. On the contrary, a spirit of roving and seafaring has been engendered within us, partly as a result of our isolation and partly as a result of the invasion of our shores by peoples who would never have found and settled in this country had they not been wanderers themselves. And so, with such blood in our veins, it is not to be wondered at that when we come under the influence of the necessary stimulus, we have no hesitation in responding to the call. In these days the opportunities for new discoveries along the lines of pure exploration steadily decrease, but there is no lack of opportunity in the realm of natural history, and there still remain vast fields of unexplored territory in the domains of botany, zoology, and geology to attract those who feel any desire to add by their own efforts to the sum of human knowledge.

There exist those who urge that we need be in no hurry to carry out expeditions to remote corners of the earth, especially in these times of acute economic depression, and this certainly is not an unreasonable point of view. Against it I would simply range the fact that there are parts of the world, in particular such islands as Mauritius, São Tomé, Principe, etc., possessing peculiar botanical and zoological features, which are in danger of being destroyed as the result of the encroachment of cultivation. In the case of the three islands named the original forest has already suffered severely, and it was with the object of attempting to gather a few of the treasures of the islands in the Gulf of Guinea, namely Fernando Po, Principe, São Tomé, and Annobon, that the expedition here described was organized. The bulk of the expense involved was borne by the Percy Sladen Memorial Fund and the Godman Exploration Fund, and to the Trustees of both funds I wish here to express publicly my personal gratitude and that of my colleague and companion on the trip, Mr. A. W. Exell.

An expedition, undertaken by the late T. Alexander Barns at the end of 1925 and during the first half of 1926, produced results which indicated that further efforts to increase our knowledge of these islands would certainly be profitable, and

the need to have more material from them in the British Museum collections with the view of assisting us in making comparative studies of the flora and fauna of the different parts of Africa, led the author to organize this new expedition. Mr. A. W. Exell accompanied me as botanist and, I may add, linguist; for his perseverance with Portuguese and his knowledge of Spanish frequently helped to carry us through difficult situations. In addition, although I undertook the general photography, the results he obtained with his Kodak are in no way inferior to my own photographs, and he often obtained better pictures.

Granted five months' special leave by the Trustees of the British Museum, we left Tilbury on October 1, 1932, for Lisbon, where we were to catch the Portuguese boat "Mouzinho" for São Tomé. We made the necessary arrangements for our departure on October 8, and, after a flying visit to Cintra, left to carry out our plan to spend a day or two at the old University town of Coimbra, visiting the Botanic Gardens and Institute and the Museum of Natural History, at the invitation of Prof. L. W. Carrisso. Senhor A. F. de Seabra very kindly showed me the entomological collections, including material from the Portuguese colonies that we were to visit. We shall never forget the kindness of our friends at Coimbra, nor the memorable trip we made in the company of Prof. and Madame Carrisso to the historic beauty spot of Bussaco. On our return to Lisbon we called on the Agent-General for the Portuguese Colonies, to whom we are greatly indebted for much valuable assistance. He generously presented us with fine maps of São Tomé and Principe, and later took us to the Industrial Exhibition, where we saw amongst other things interesting exhibits from the Portuguese colonies.

We sailed that evening, much relieved to be actually afloat after the usual trying experiences over tickets and customs. Even when everything has been carefully arranged and every facility exists for smoothing one's way, it is astonishing how trivial obstacles seem unexpectedly to arise. I received a letter from the Secretary to the British Embassy at Lisbon informing me that the Ministry of the Colonies had been good enough to issue the necessary instructions to the Colonial authorities to grant us special customs and other facilities, which had been requested on our behalf by His Majesty's Embassy on the instructions of the Foreign Office. Before leaving England we had been informed that similar facilities had been granted by the Spanish Colonial authorities; so we felt that nothing had

been left undone and we could go forward with light hearts: our confidence was fully justified.

Sunday, October 9, saw us well on the way to Madeira in stormy weather, which gave place to calmer and brighter conditions on the following day, during the evening of which we reached Funchal. The view of the island at sunset was so beautiful that merely recalling it stirs within one a great desire to see it again. We were only able to see the sparkling lights of the town, as it was dark by the time we dropped anchor, and, as our stay was to be short and that during the night, we thought it wiser, as neither of us knew the place, to refrain from going ashore. The following day broke fine and bright, but our view of Teneriffe in the late evening was not enhanced by the presence of mist. Three days later we passed close to Cape Verde, and Dakar came into view not long afterwards. On Sunday, October 16, we rose from breakfast to find ourselves passing the old British colony of Sierra Leone in a glassy sea, which was to be for us typical of this "corner" of the Atlantic. There remained but the five days' run to São Tomé, during which we gradually diverged from the coast of Liberia, and only saw land again as we neared our destination. As neither of us had been in the tropics before, our feelings can better be imagined than described. Although the island of São Tomé has been so extensively cultivated that the verdure which meets the eye on a first approach is almost entirely that of plantations, yet it is a stirring and inspiring sight.

The Captain of the "Mouzinho," who spoke excellent English and to whom we are greatly indebted for many kindnesses on the voyage, advised us to wait until he could hand us over to the agent of the Companhia Colonial de Navegação, and this resulted in our arriving at a hotel at 11.45 p.m. The first hotel to which we were conducted having no accommodation, we were taken to another, and we realized as soon as the electric light was switched on that we were in the tropics; for away scampered in all directions huge cockroaches, and large ants were to be seen running across the floor. By 12.30 a.m. our landlord with many apologies had fixed us up with a couple of beds without mosquito curtains, and, as we had only our hand luggage and our own curtains were still on the ship, we had to resign ourselves to taking the risk of getting malaria right at the start of our tropical experience. After a few desultory and hopeless attempts to rid the room of mosquitoes we went to sleep with them buzzing about our ears.

Next morning we were not filled with any particular anxiety

to eat breakfast in the dining-room of our hotel. I am sure that I shall be forgiven for a slight exaggeration when I say that a glimpse into the *sala de jantar* on the previous night had

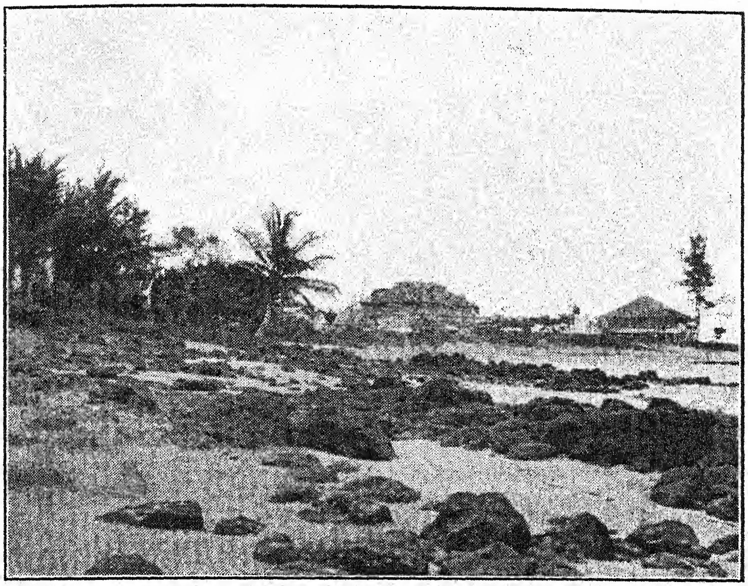


FIG. 1.—CABLE STATION (centre of picture), SÃO TOMÉ.

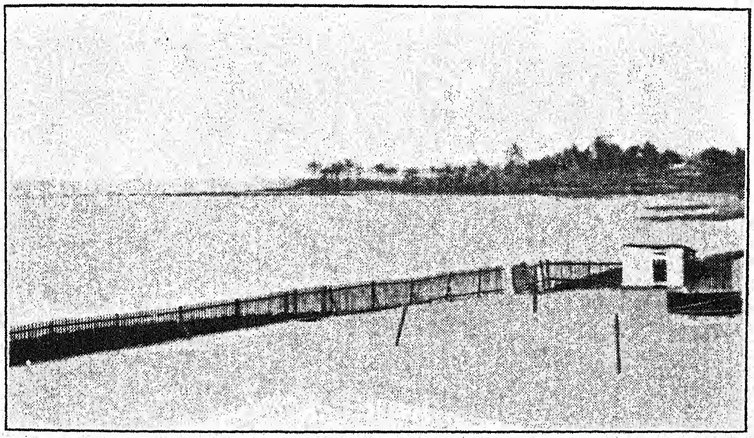


FIG. 2.—VIEW, LOOKING SOUTH-EAST, FROM CABLE STATION, SÃO TOMÉ.

disclosed to our astonished gaze dirty table-cloths with hordes of disappearing cockroaches, disturbed by the sudden lighting-up of the room. However, anticipating a strenuous day's work,

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to eat breakfast in the dining-room of our hotel. I am sure that I shall be forgiven for a slight exaggeration when I say that a glimpse into the *sala de jantar* on the previous night had

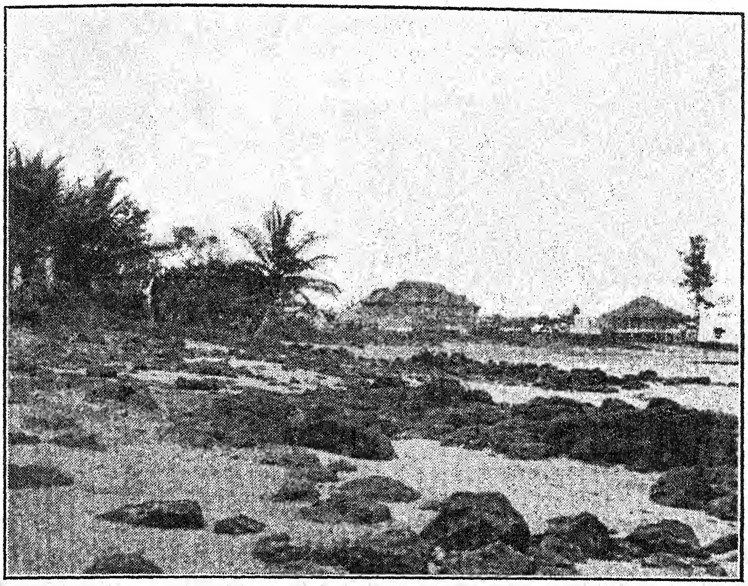


FIG. 1.—CABLE STATION (centre of picture), SÃO TOMÉ.

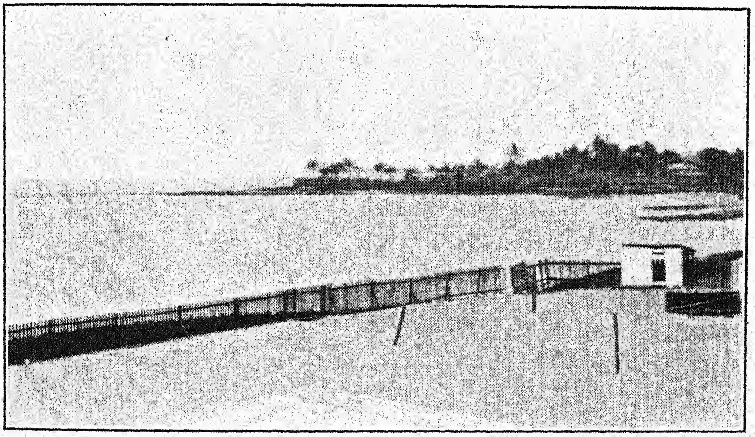


FIG. 2.—VIEW, LOOKING SOUTH-EAST, FROM CABLE STATION, SÃO TOMÉ.

disclosed to our astonished gaze dirty table-cloths with hordes of disappearing cockroaches, disturbed by the sudden lighting-up of the room. However, anticipating a strenuous day's work,

we set to and tackled the coffee and rolls with more courage and endurance than enjoyment. After a visit to the agent of the Shipping Company, we hired a car and drove round to the Cable Station (Figs. 1, 2) to make the acquaintance of Mr. L. P. Cauvin, the Superintendent, to whom we had an introduction. From that moment, so far as concerned the Portuguese islands, any difficulties that might have been lying ahead of us vanished into thin air, and it will be difficult for us ever to express adequately our gratitude to the only Englishman—or rather Irishman, if that be not too Irish—in São Tomé at

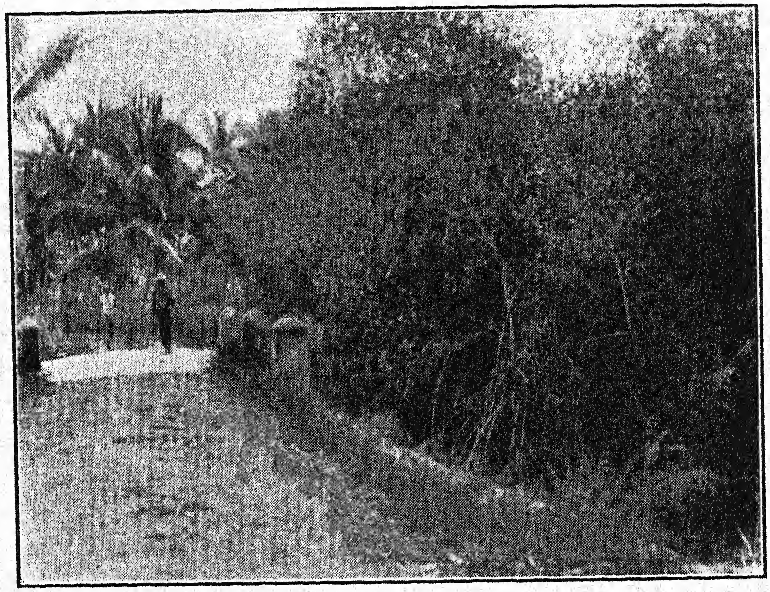


Fig. 3.—Mangroves, São Tomé.

the time of our visit. Mr. Cauvin spared nothing in his efforts on our behalf, and I can only express the hope that any English visitor to São Tomé in the future will find in his successor such another friend. Until we finally left the Portuguese islands for Fernando Po, we were always sure, not only of a warm welcome at the Cabo Submarino, but also equally certain of every facility for storing, packing and unpacking, and handling our baggage, or arranging for our future movements.

Mr. Cauvin without delay presented us to His Excellency the Governor of São Tomé and Principe, who at once gave instructions for all Customs formalities to be dispensed with, and offered to assist us further in any way that lay in his power.

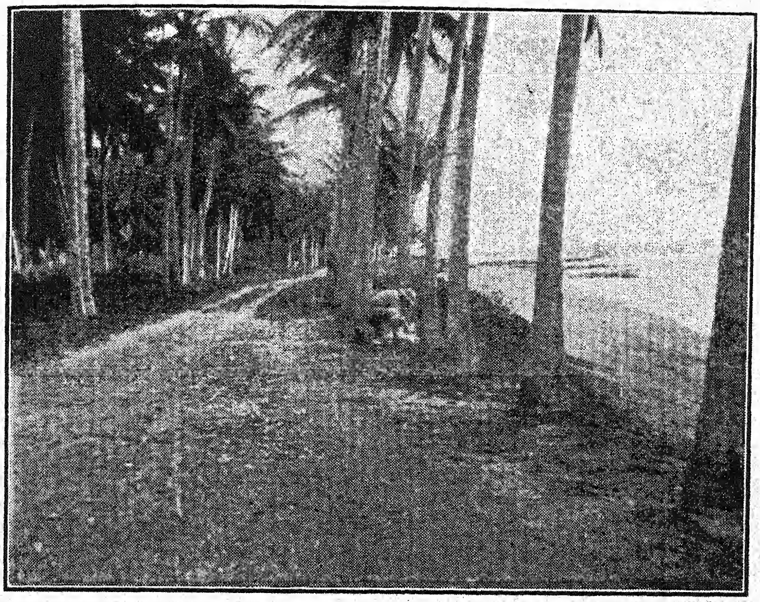


Fig. 4.—Mr. A. W. Exell collecting Plants by the Sea, São Tomé.

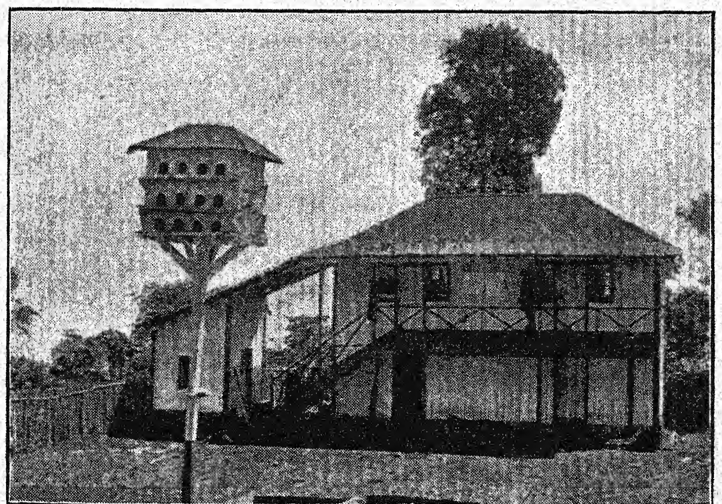


Fig. 5.—Our House at Vanhulst, São Tomé.

The same evening Mr. Cauvin took us for a trip by automobile along the shore road to the fishing village of Pantufo, and on the way we crossed an almost dried-up stream, with mangroves on its banks and many climbing perch on the mud beneath the mangroves (Fig. 3). On the following day we made two trips along the beach road in order to sample the plants and insects, but did not find very much (Fig. 4). In the afternoon we met Mr. W. G. van Leeuwen, Vice-Consul for the Netherlands, Administrateur-Directeur de La Société Anonyme "Amparo," and to him we owe a great debt of gratitude for allowing us the use of the little house of Vanhulst (Makambrará) (Fig. 5), a *dependencia* of the Roça Zampalma (or Jamar, as it is apparently sometimes called).

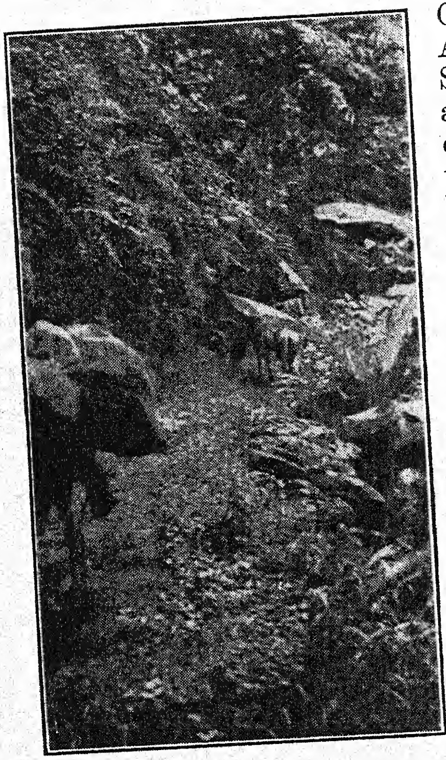
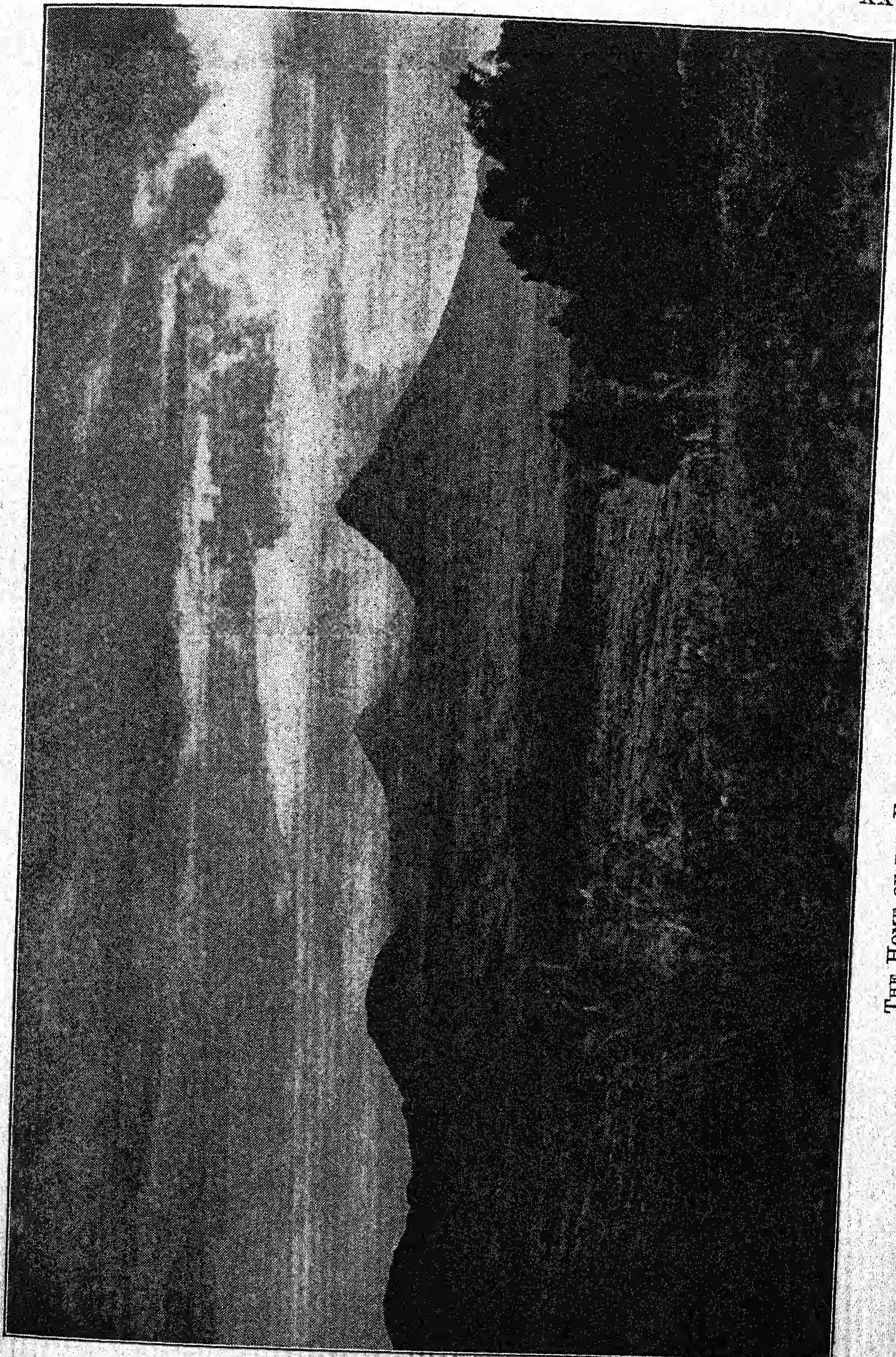


Fig. 6.—Mule-track to Vanhulst, São Tomé.

On the Sunday we went by automobile to the Roça Rio do Ouro, where we had the good fortune to meet Senhor Rafael Oliveira and Dr. Eduardo Nogueira de Lemos. We regretted very much that we were unable to spend more time in some of the low-lying country such as that in which the Roça Rio do Ouro was situated, or the country to the south and west, particularly around Porto Alegre and the Ilha das Rôlas. But we had to bear in mind two things. First, in these islands one is often almost entirely dependent on the generosity of the owners of the roças or their representatives for any transport beyond the ends of the roads; in the case of Zampalma the motor road only took us to 2000 feet, and from Zampalma to Vanhulst (4000 feet) there was only a good mule-track (Fig. 6). Second, it is very necessary to accept offers of assistance without hesitation. One soon finds out that an ambitious programme is exceedingly easy to draw up in England; but, when one is faced with transporting heavy packages up mountains, one cannot afford to miss opportunities. The result in our case



THE HOME OF THE EASTERN GORILLA: BIRUNGA MOUNTAINS.

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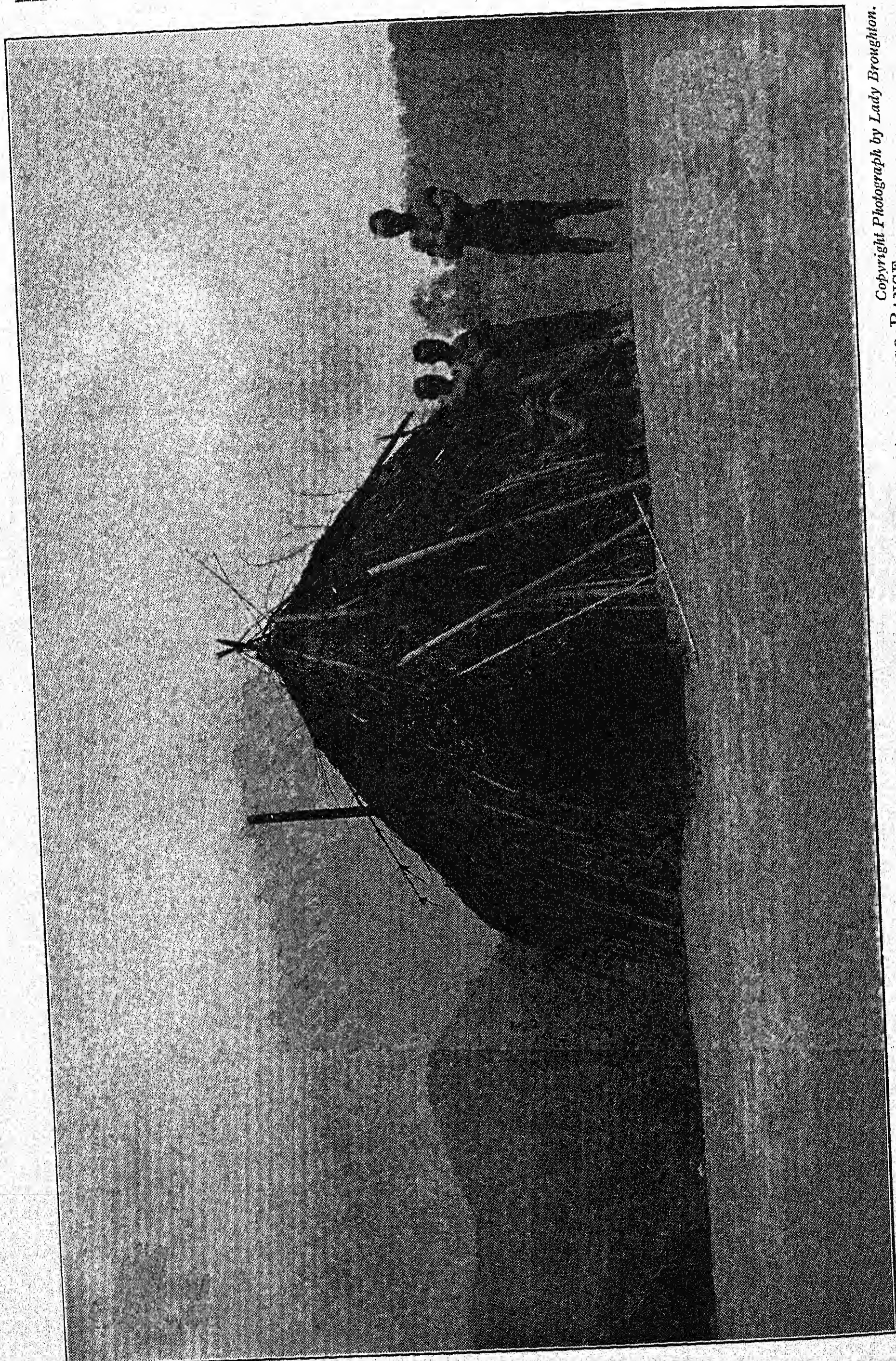

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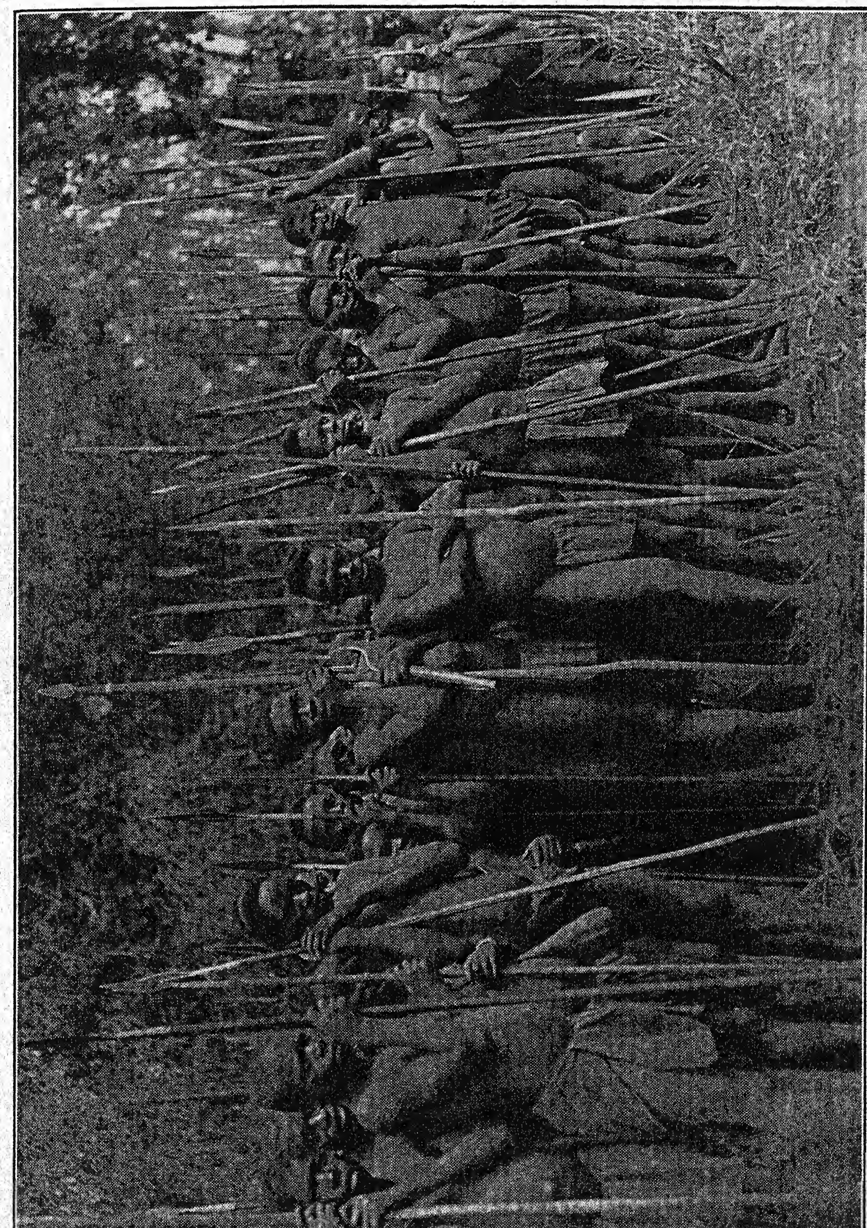
THE HOME OF THE EASTERN GORILLA: NATIVE HUT ON THE ALUMBONGO RANGE.



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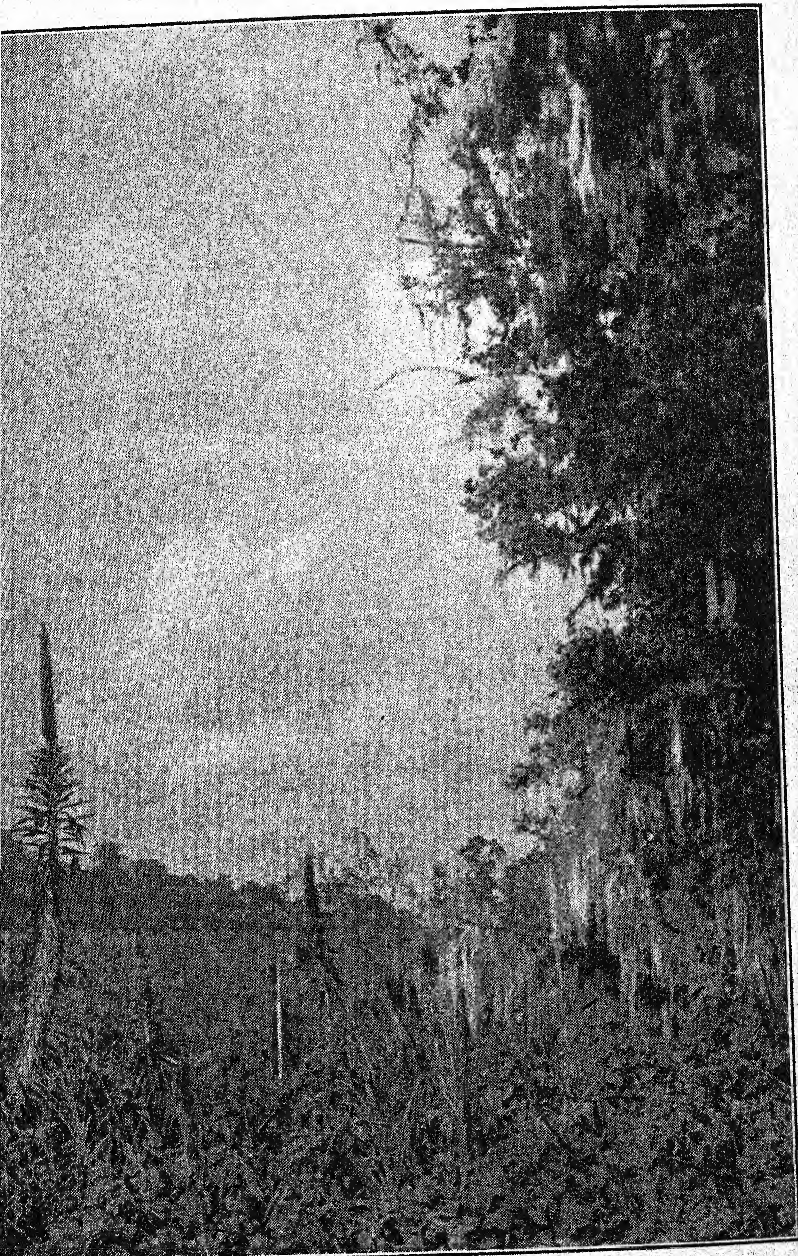
THE HOME OF THE EASTERN GORILLA: PARTY OF ALUMBONGO NATIVES.



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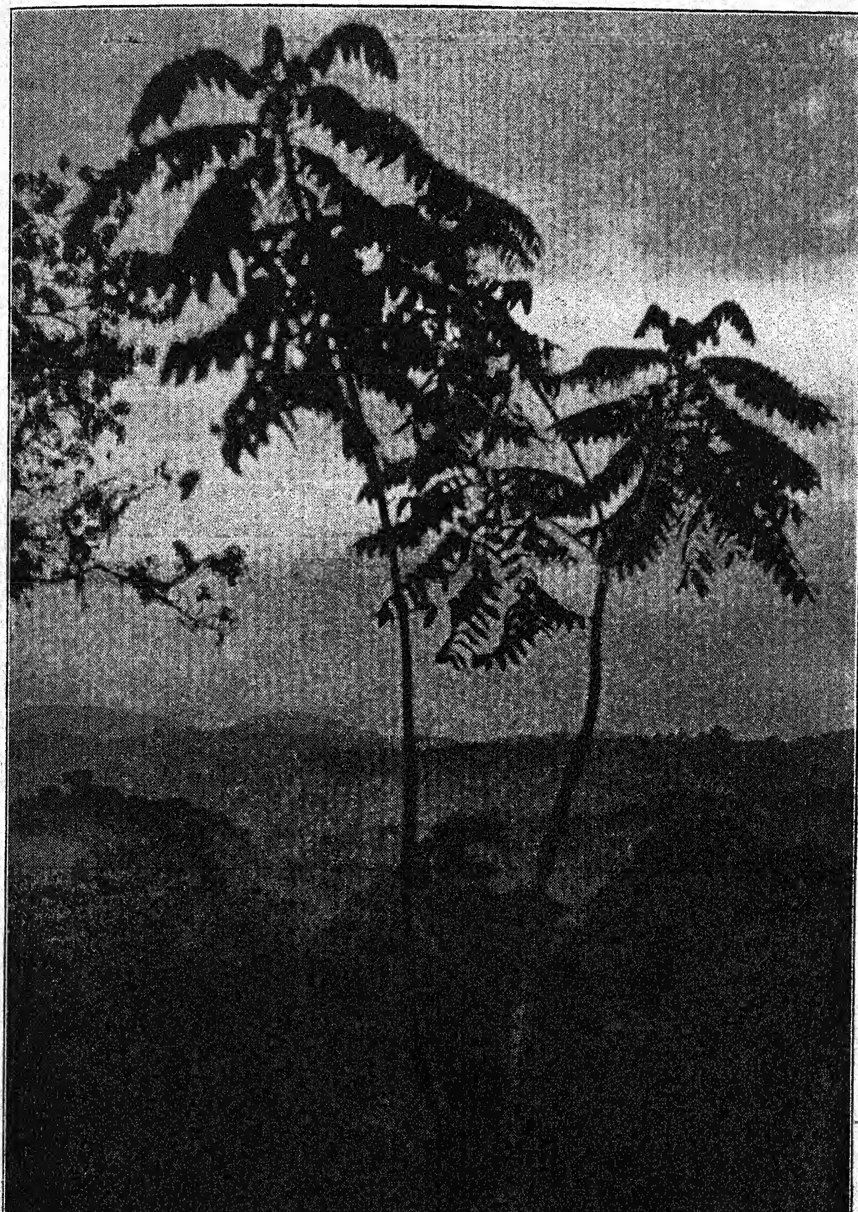
THE HOME OF THE EASTERN GORILLA: LOBELIAS AND BEARD-MOSS.



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THE HOME OF THE EASTERN GORILLA FOREST SCENE IN THE ALUMBONGO RANGE.

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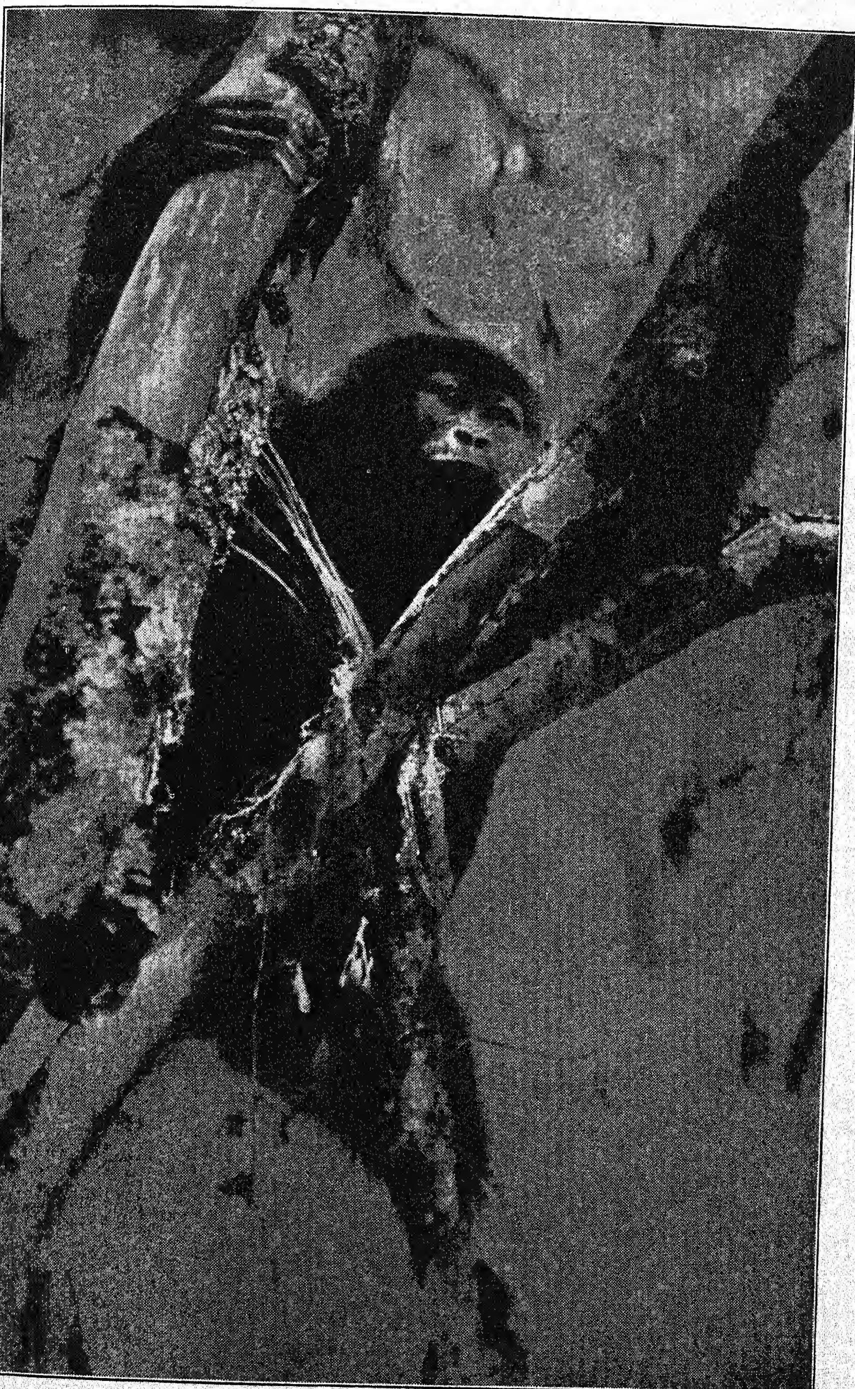
THE HOME OF THE EASTERN GORILLA: YOUNG MALE GORILLA.



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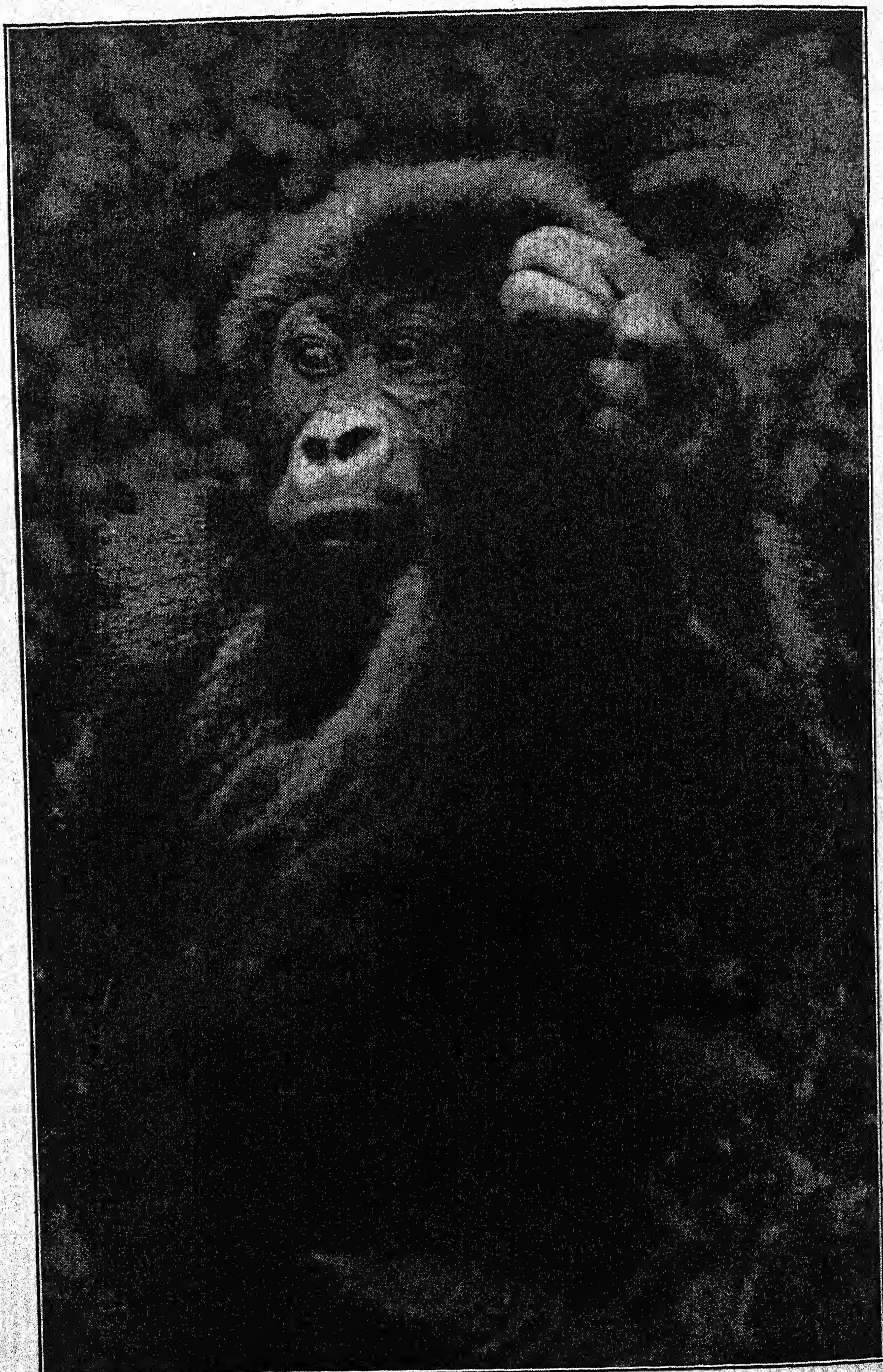
THE HOME OF THE EASTERN GORILLA: YOUNG GORILLA CLIMBING.



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THE HOME OF THE EASTERN GORILLA: FEMALE GORILLA.

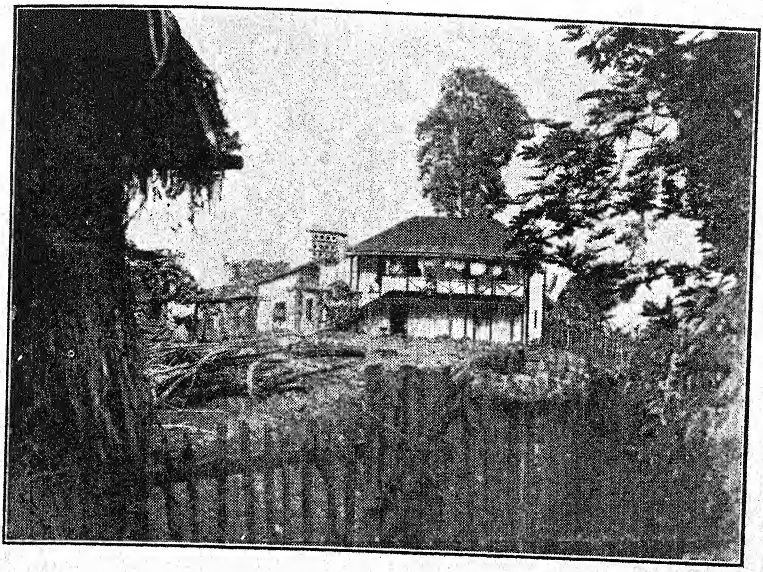

FIG. 7.—VANHULST, SÃO TOMÉ.

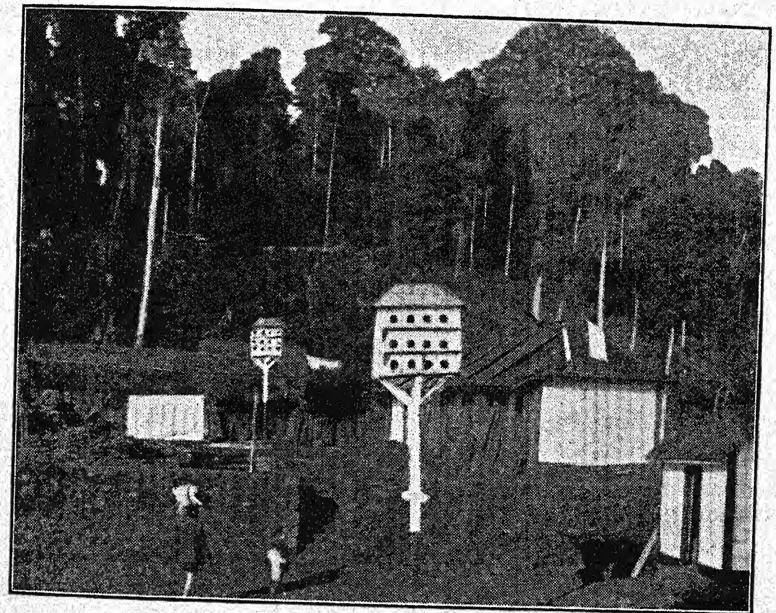

FIG. 8.—VIEW OF FOREST FROM VANHULST, SÃO TOMÉ.

was that, attractive as the prospect of a stay at such a place as the Roça Rio do Ouro appeared, the offer of Mr. Guilherme van Leeuwen to show us Vanhulst, a small coffee plantation on the edge of good original forest, was eagerly accepted, and when on October 26 we went up to Vanhulst with Senhor José Mendes Ferreira and saw the forest within five minutes' walk of the little house, we could not do other than decide at once to accept gratefully Mr. Van Leeuwen's offer (Figs. 7, 8). I am sorry that I have no photograph of the procession up to Vanhulst on that occasion, as we looked rather like Don Quixote and

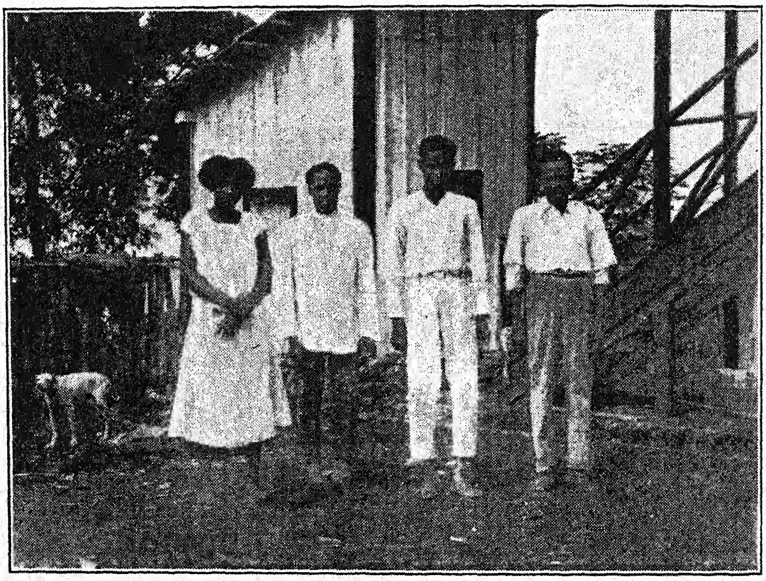

FIG. 9.—OUR SERVANTS AT VANHULST, SÃO TOMÉ.

Sancho Panza, the one on horseback and the other on a mule. The following day we went up on foot, accompanied by carriers from Zampalma and also by our cook, Nazaré, and his wife. The two boys first selected for us turned up at Zampalma before we started, dressed for a holiday in the city, and were at once dismissed by Mr. van Leeuwen, who promised to send us up two boys from Trinidade on his way down. This he kindly did, and we had good reason to be grateful to him; for they both proved to be such good servants that we had no hesitation in taking them to Principe with us later (Fig. 9). It did not take us long to get our new home into order and to start exploring the surrounding country. The *dependencia* of Vanhulst was in charge of a native, Cabo by name, and he

looked after the house until our two boys arrived, and he afterwards became very friendly and served us in many ways. The *serviçais* (native labourers from the mainland), of whom there were not a great number at Vanhulst, lived in a row of huts in the compound (Fig. 8), in which there was also a stable and a poultry house. They were generally to be seen during the hours of daylight (5.30 a.m. to 5.30 p.m.) at their tasks in the plantation, or making or improving roads.

Fig. 10.—View of Pico de São Tomé from Calvario, São Tomé.

We managed to live very well at Vanhulst, and our servants (Fig. 9) seemed well satisfied with their rations, which consisted of beans, rice, fuba or banana flour, dried fish, and bananas. We took up with us some tinned provisions and two dozen fowls, and we managed to get potatoes, rice, bananas, and occasionally bread from the Roça Zampalma. We were also able to get Portuguese wine at sixpence a bottle. Our cook, Nazaré, was excellent, and we never ceased to be amazed at the three courses he would produce for the two of us out of a fowl, little bigger than a bantam, and a little rice. This generally took the form of soup, a dish of pieces of chicken (including the liver, heart, etc.) mixed with rice, flavoured with a kind of tomato paste, followed by roast chicken—the legs and breast. We always thought that he killed and dismembered the chicken with a log of wood or some other heavy blunt object, otherwise he could never have produced the second dish, from which I omitted one of the ingredients when I mentioned it just now, namely, numerous splinters of bone.

We stayed at Vanhulst from October 27 until November 26, and, though I found it very disappointing from the point of view of the number of insects obtainable during the daytime,

the number of moths that came to light at night was more satisfactory. Collecting in the forest, where the trees were always dripping wet, was not very productive either by day or by night, and I had no success with light other than at the house, where the whitewashed wall provided a good screen. By walking up and down the forest paths carrying the lamp I caught a few Geometridae of rarely more than one or two species. Occasionally the number of moths coming to light on the verandah was exciting enough to induce Mr. Exell to lend

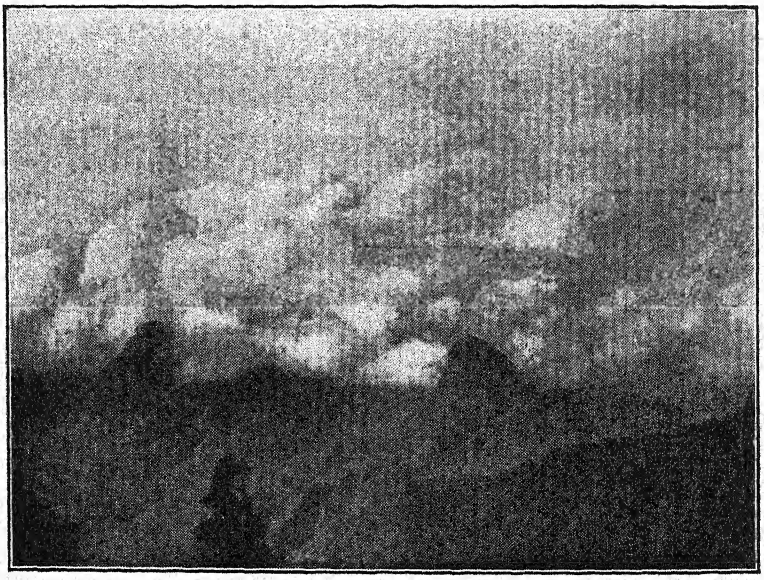

Fig. 11.—Clouds and Mountains, São Tomé.

a hand, but there was generally on these occasions a proportion of common species of which I had to stop taking specimens.

Of the excursions we made from Vanhulst the most exciting was our ascent of the Pico de São Tomé (6642 feet) on November 12 (Fig. 10). A day or two earlier Mr. Exell had made a trip to Calvario (5230 feet), and had discovered that Mecoto, the older of our two boys, could not face the crossing of the ridge known as the *escadas* (ladders), which connects that mountain with the Pico. The drop on each side of this ridge is so great and so absolutely sheer, that in the misty conditions, which nearly always obtain around these mountains (Fig. 11), it is difficult to judge the distance, but it seemed to us that it must be between two and three thousand feet at least. We decided

to undertake the trip from Calvario by ourselves. We set out on Armistice Day, 1932, and arrived at the top of Calvario (Fig. 12) in a storm, and were compelled to put up our tent in the rain. We made ourselves comfortable for the night and sent the boys back to Vanhulst. Next morning we set out soon after 6 a.m., crossed the *escadas* and climbed the Pico, reaching the summit in pouring rain about 9.30 a.m. On the way up

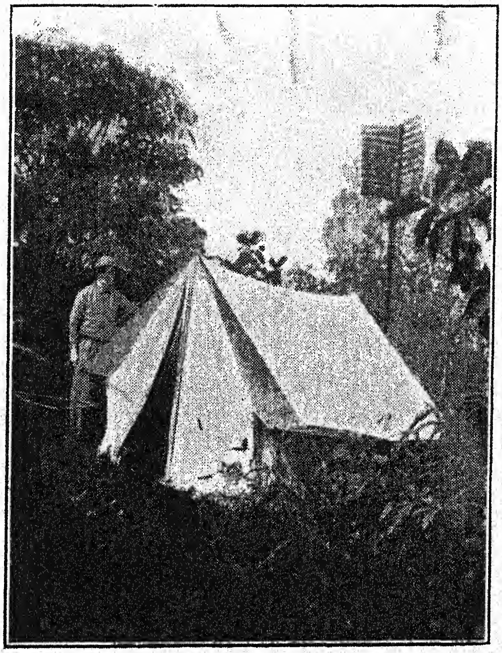

Fig. 12.—Camp at summit of Calvario, São Tomé.
Mr. A. W. Exell standing beside the tent.

we found the curious conifer, *Podocarpus Mannii*, and at the top the fine tree-heath, *Philippia thomensis*. Mr. Exell gathered specimens of these two plants and a few others, and then, as there seemed nothing else to be got and we were thoroughly chilled through, being soaked to the skin by icy cold rain, we decided to return to our camp. We were surprised to find cinchonas (quinine) planted right to the summit of Calvario, and certainly above 6000 feet on the Pico de São Tomé.

(*To be continued.*)

BEHIND THE SCENES IN THE MUSEUM. IV.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

The previous articles have been devoted to the persons and groups of persons who are responsible for the smooth working of the Museum as a Government institution, for the maintenance of the fabric and its contents, and for the efficient correlation of the work of the Scientific Departments. What of these Departments themselves?

The scientific work of the Museum, which is after all the main purpose of the institution, is done by the Scientific Staff, divided into Departments according to the nature of the things they study. There are five such Departments: those of Zoology, Entomology, Geology, Mineralogy, and Botany. They are officially quoted in that order and so we shall treat them here, beginning the description of the scientific work with the Department of Zoology.

This is not the oldest of the Museum Departments; but it is quite definitely the largest, both numerically and territorially. Its premises include the whole of the western wing of the Museum (except for the basement floor and part of a small gallery), the greater portion of the new Spirit Building on the north-western side of the Museum (Fig. 1), and the new Whale Hall * with its basement (Fig. 2). In addition, a Preparators' Shop and the old Spirit Building (Fig. 3) are under the control of the Zoological Department; they are situated on the west and north of the main buildings respectively. Thus, the premises of the Zoological Department cover more than half the area of the whole building, and more than two acres of exhibition space.

The Staff which works in these buildings deals with zoological material in workshop, store-room, study, or gallery, prepares exhibits, issues reports on collections, and answers queries, as well as performing the routine duties inseparable from any office and constantly carrying on the research made possible by the excellent material in its care. The personnel is under the direction of the Keeper, the present head of the Department being Dr. W. T. Calman, F.R.S. There are two Deputy Keepers, who assist in this directional function, and thirteen Assistant Keepers, each of whom has charge of one group or more of animals, and is responsible to the Keeper for the care of these

* An illustrated description of the building is given in vol. iii, pp. 184–188.

collections and the exhibits, etc., relative to the particular group. There are also seven temporary or unofficial scientific workers, who give assistance with certain animal groups. In addition to these persons employed on wholly scientific duties there are

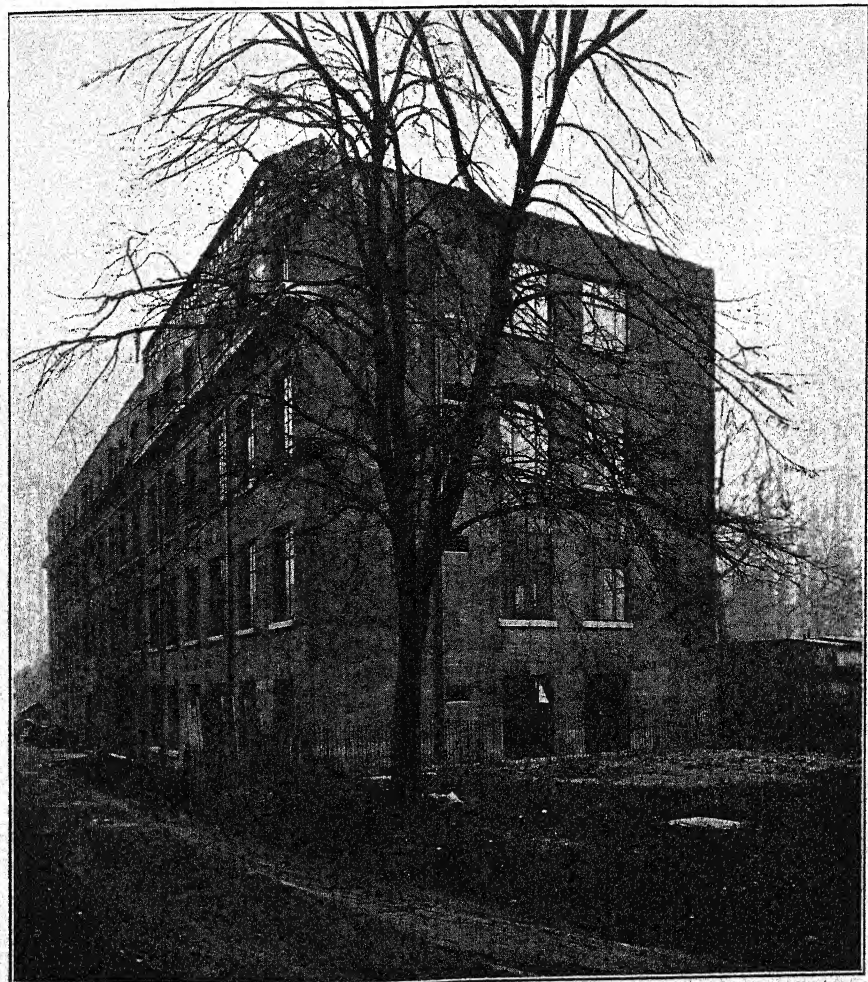

FIG. 1.—NEW SPIRIT BUILDING.
Photograph taken before the erection of the new Whale Building.

a librarian, seven clerks, six technical assistants, ten attendants, and four typists, making a total Departmental Staff of fifty-one.

In order to appreciate the work and resources of the Department it may be best to describe the sequence of events concerned with a collection.

Collections are obtained by the Museum in a variety of ways. A ready-made collection may be presented to, or purchased by,

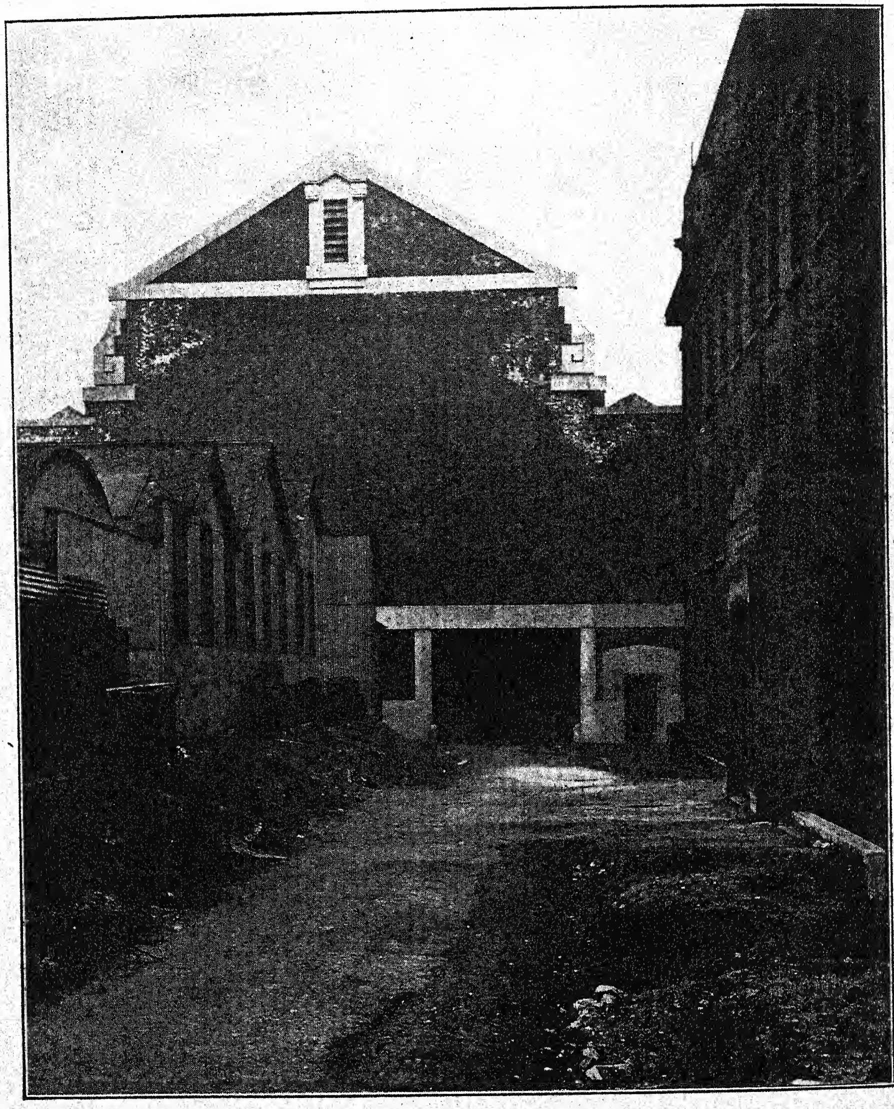

FIG. 2.—NEW WHALE BUILDING.
On left, temporary building containing Oceanographical Collections; on right, new Spirit Building. Roadway tunnels under, curving to the right.

the Trustees of the Museum for a Department, or an expedition may present some of its results in an unprepared condition, or a member of the Staff may be sent off to collect. The

Department has been fortunate in its friends, for many fine collections have been made available from regions, often remote, in all parts of the world. Cooperation with other Departments of the Government has also resulted in an increase of the Museum's contents, and the interest and services of many Political and Service Officers have been of great value to zoology. Specimens may be acquired through the exchange of duplicates.

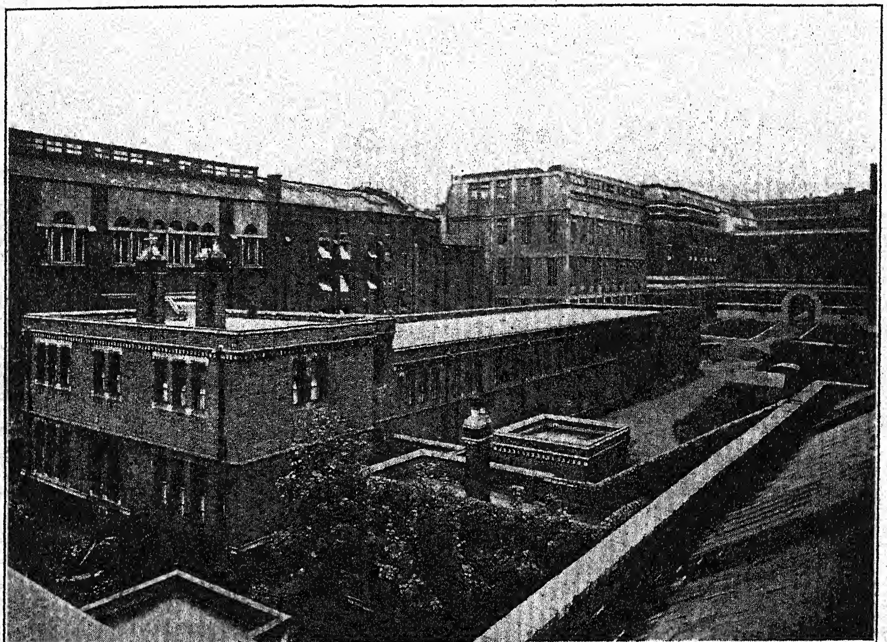

FIG. 3.—OLD SPIRIT BUILDING.
Above, from left to right, Science Museum, with corridor-bridge communicating with new Museum of Practical Geology.

Much of the organization work of these expeditions falls upon the Museum Office, as was mentioned in a previous article, but the necessary technical advice can only be given by one who is intimately aware of the special needs of special zoological groups. There are many articles too that the Museum has to lend to bona-fide collectors who will assist its work and add to its contents. Collecting apparatus, tanks, and the preserving fluids, such as alcohol or formalin, all require careful preparation and examination. The specialist aspect of such collecting journeys falls upon the members of the Zoological Department.

There is another and little known duty that falls upon that Department. If any whale is stranded upon the British coast, by an arrangement with the Board of Trade, the Coastguard or Receiver of Wrecks is required to telegraph the circumstances to the Museum. Often the matter is taken up and the whale, or a part of it, is either cast in plaster where it lies or transported to the Museum: if the Museum does not require it, it is disposed of locally. Sometimes, the Museum's part in this business involves considerable work, as in 1927 when a whole school of "False killer" whales (*Pseudorca crassidens*), numbering one hundred and twenty-five individuals, was dealt with at Bonar Bridge, in the Dornoch Firth, by members of the Zoological Staff. These whales were all dealt with on the spot and their skeletons are now undergoing examination in the Museum. In any event full particulars of all such strandings, of which something like forty occur each year, are recorded at the Museum.

In a previous article the procedure on the arrival of a general collection or a large specimen has been described. Naturally, the zoological material is at once transferred to the appropriate person. There is a special Zoological unpacking room where the needs of the particular group of animals concerned can be met, and where information is noted for use in registering the specimens later. The collection must be carefully sorted and the groups given to the Assistant Keepers in charge of them. Material in preservatives must be specially cared for and transferred to fresh vessels with the correct strength of fresh preserving fluid, for the preservatives used by the collector in the field may not be the best for museum purposes or for long-continued use. Skin specimens must be chemically treated to kill destructive insects and for preservation, and for this purpose a special room exists below the new Whale Hall. Other animals may arrive unskinned and the skin must then be removed for stuffing or for storage, while the flesh has to be got rid of so as to leave the skeleton in a suitable condition for handling. Anatomical investigation is frequently made before the flesh is removed, and the stomach contents as well as the skin are usually searched for parasitic forms of life which are also examined scientifically and may be added to the collections.

The removal of the flesh and muscles from the bones is known as maceration, and is accomplished either by boiling the specimens, as is done with smaller mammals and pieces of whales, or by burying in a sand-pit where after a time the flesh rots away and leaves the bones free. The latter process is used for

larger mammalian carcases, but the Museum has facilities for both processes and they are much used.

The method of preserving the material differs: invertebrates, fishes, small reptiles, and amphibia are usually preserved in spirit or in formalin; while birds and mammals are preserved as skins, some of which may be stuffed to reproduce the living appearance, as is generally done with exhibited specimens, the skeletons being separately stored, usually in the Osteological room, for comparison, or entire specimens may be preserved in spirit.

When the specimens are thus ready for the further stages of their Museum progress, some scientific examination is made of them and they are named as accurately as possible and registered. Every Museum specimen is registered, though the actual method of registration varies slightly in the different Departments. The scientific name, the locality of origin, the name of the donor or vendor, and the date of registration are entered in a book against a number, and this number and the date are written or printed on a small label which is attached to the specimen, or to the jar containing it, or to the label on bottle, microscope slide, or other container. Card indexes are usually kept of all the specimens and their place in the exhibition gallery or the store, so that every specimen is really easily accessible. It will be realized that a rigid adherence to rules and a careful organization are necessary, when it is borne in mind that there are some three million specimens in the Zoological Department and any one of them may be wanted at a moment's notice.

After registration the specimens are variously dealt with: they may be stored or placed on exhibition forthwith, or made the subject of study, the results of which may be published by a learned society or included in the report of a Government Department.

Storage does not imply, as so many members of the public seem to think, that the material is out of sight and out of mind. In store it is more easily accessible to the student and specialist than when on exhibition. Further, exhibition value and scientific worth are by no means synonymous terms, and many animals of the greatest scientific importance would be meaningless and even dull as public exhibits. Thus a great proportion of the Museum's wealth is in the form of stored specimens. This point is worth stressing as so many visitors believe the whole function of the Museum is exhibition, and that all the Museum's contents are on show. A few instances will dispel

this illusion. The store-room area of the Zoological Department is a little less than the whole of that of its exhibition galleries, but it must be remembered that storage conditions can be more crowded than can be exhibition cases. In the fish collection there are two hundred thousand specimens, while it will be obvious to any visitor that not one per cent. of this number is exhibited in the Fish Gallery. In other groups, particularly among the invertebrates, of which there are nearly two millions,

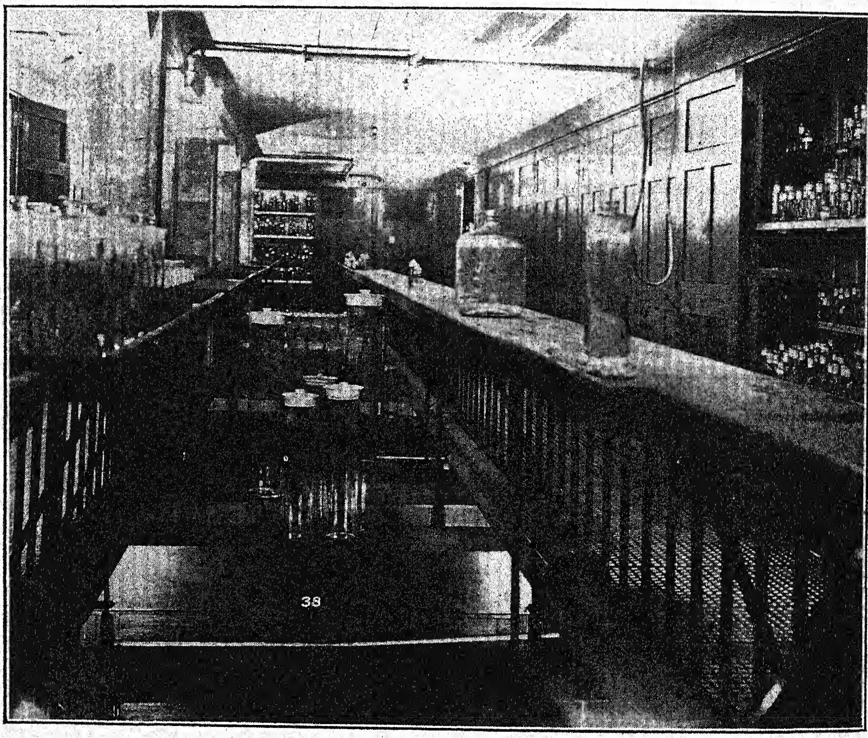

FIG. 4.—STORE-ROOM INTERIOR, NEW SPIRIT BUILDING.

the percentage of exhibited material is even smaller. In the higher vertebrate groups the ratio may be higher, but it is still relatively low.

This will serve to show that an overwhelming amount of zoological material is stored. As this is very valuable, the storage conditions must be as nearly ideal as is possible. Accordingly, store-rooms are well lit, airy, conveniently built, and kept continually in excellent order. The specimens are fully catalogued, and periodic inspection ensures that overheating, evaporation of preserving media, or any other undesirable circum-

stances are kept in check. With skeletal specimens the storage arrangements are quite commonplace, but perhaps few persons have realized what large quantities of inflammable spirit are contained in the old and new Spirit Buildings. In the main (public) Museum building the number of spirit specimens is almost negligible, but in the Spirit Buildings by far the greater part of the space is devoted to their storage. Naturally the most stringent regulations are in force to prevent fire. The new

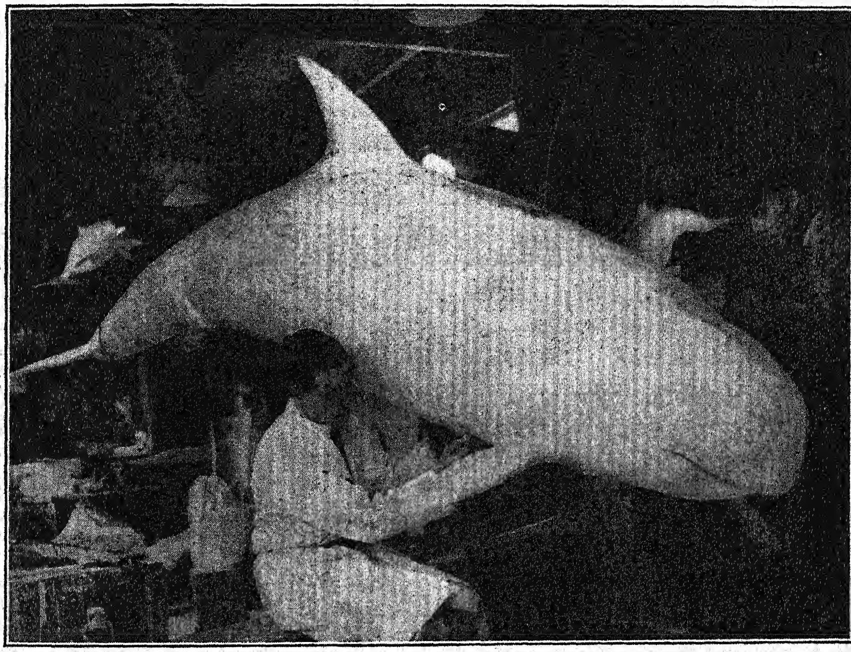

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FIG. 5.—CAST-MAKING IN THE PREPARATORS' SHOP.

Spirit Building, for example (Figs. 1 and 4), is a ferro-concrete structure, with metal fire-proof doors throughout, and with a widespread system of sprinkler-valve fire-prevention devices. Although the spirit used has not a high degree of volatility, the amount of irreparable damage that could be caused is not pleasant to contemplate.

Such stored material, then, is every day used for examination and comparison by the Staff, and is examined every year by large numbers of investigators. No special comment need be made here on museum study-methods, as they are, in the main, similar to those of persons in university laboratories.

The visitor may notice that in many instances the exhibits are composed not of real specimens but of plaster-casts. The reason for this is that the need for preserving the specimen makes its exhibition difficult, or that exposure to light would be harmful. Often also the animal is required for study and for the purposes of the exhibition-case a cast is just as suitable. With such things as whales, it would be obviously impossible for many reasons to exhibit the real thing. Quite apart from the great weight, the Public Health authorities would raise objections! In all these instances casts are used, and the source of them is the Preparators' Shop (Fig. 5). The manufacture of reproductions of delicate animal organisms demands manipulative skill, artistic ability, and patience, as well as a considerable knowledge of the animals themselves, while the casting of large animals calls for no little mechanical ingenuity. The process, though apparently simple when seen, is not so easy to carry out, while to colour the finished cast so that the model is scarcely distinguishable from the original is a praiseworthy performance. In the Preparators' Shop the skins of birds are also prepared and stuffed.

But the work of the Staff cannot wholly be devoted to the duties already outlined. The number of visitors with queries to be answered, and specimens to be identified, or who seek and receive advice, is very large and seems continually to increase. In addition, there are many inquiries by post and telephone, not only from private individuals but also from commercial bodies, Public Authorities, and Government Departments. It is perhaps too little realized by the public how much they are indebted to the research work of National Museum staffs. It is true that the main part of the Zoological Department's work is systematic, but upon that sure foundation the rest of zoological work must rest to be secure. The researches of the Staff have bearings, often to no small degree, upon Medicine, Public Health, Agriculture, and many other, some of them industrial, fields. It is no over-statement to say that the realization of the grave Musk Rat menace in this country originated in the Zoological Department of the Museum.

One feature of the Department that must be mentioned is the excellent library of over fifty thousand works, which is probably the best zoological library in the world. Indispensable to the Staff and used by numerous visitors, this great store of zoological knowledge is available to all genuine students and inquirers.

The Staff is intimately connected with most of the move-

ments of importance to animal life in this country. The Musk Rat campaign organization, committees that investigate the use of animal skins in commerce, and, on the other hand, societies for the preservation of faunas at home and abroad, all have Museum representatives.

Meanwhile, additions to the collections come in at the rate of something like fifty thousand a year. Exhibits have to be repaired and renewed, expeditions sent off, books have to be written, reports issued, and correspondence continued. Telephonic communications regarding the names of animals in cross-word puzzles are therefore not encouraged. Every year some 13,000 visits for the purpose of study are recorded for the Department of Zoology.

BOOK NOTICES.

The History of the Entomological Society of London, 1833–1933. By S. A. Neave, O.B.E., D.Sc., assisted by F. J. Griffin, A.L.A., with an Introduction by E. B. Poulton, D.Sc., F.R.S., and a Financial Chapter by A. F. Hemming, C.B.E. Pp. xlvi + 244, with 8 plates. (London: published by the Society. 1933.)

On May 3 and 4 the Royal (as it now is) Entomological Society of London celebrated the completion of one hundred years of life and attracted to the celebration a large number of delegates from kindred and allied societies at home and abroad. It is customary on occasions of this kind to compile a synopsis of the history of the particular society, and such is the reason for the present book. It has been penned mainly by the Society's Honorary Secretary, Dr. Neave; but an extremely interesting chapter, the Introduction, has been contributed by the President, Prof. Poulton, whose first paper was read before the Society in the year of the Jubilee, 1833, fifty years ago.

The study of insects in England goes back very much further than the foundation of the present Society, and it is only the unfortunate lack of continuity that has prevented the celebration, perhaps now, of a bicentenary, as the Aurelian Society was in existence as early as 1745; but it passed. There was formed in 1780 the Society of Entomologists of London, but two years saw the end of it. The Aurelian Society was revived twice and expired. The existing Society too had its crises, even so late as 1874 when it was nearly absorbed by the Linnean Society. All such societies have their troubles, principally due to lack of money, but in the Entomological Society the personal equation appears to have been unusually prominent. Thanks to the support of many generous fellows, the Society is now firmly founded and in a strong financial position. Its very activity will, however, inevitably lead in course of time to congested accommodation for books.

Members of the Museum Staff cannot but be interested in the close relations that have always obtained between the Society and the Museum. It was, indeed, founded in the official apartments of J. G. Children in the old building at Bloomsbury, and he was its first President. With hardly an exception all those who have been charged with the care of insects in the Museum became

members of the Society, many of them served on the Council, and some held an office. The Society's headquarters too have always been near the National Collection of Insects, once at Bloomsbury and now at South Kensington.

The illustration of the room in the Thatched House Tavern, where the first General Meeting of the Society was held, gives perhaps a misleading impression of the lavish splendour of meetings of learned societies in those spacious days. The Dilettanti Society is the one shown in session; the Entomological Society is believed to have been more modest in its concomitants.

British Beetles, their Homes and Habits. By NORMAN H. JOY. Pp. xi + 143, with 27 plates and 21 figures in the text. (London: Frederick Warne & Co., Ltd. 1933. 5*s.*)

THIS book consists in great part of extracts from a larger work by the same author and bears evidence of having been very hastily put together. Its title is rather misleading. Its main object proves to be to supply instructions for the formation of a collection of beetles and assistance in identifying some of the species to be found in Britain. For this purpose a number of "keys" are included, giving superficial characters for the separation of the insects into groups called sub-orders, families, etc. The limits of these have to be accommodated to the unimportant differentia selected, resulting in a system of classification at variance with those to be found in scientific literature. This is likely to prove a hindrance to any who attempt to follow the author. Information as to homes and habits is only incidental and of a very fragmentary kind. The letterpress consists of only 80 pages of large print (it would consist of less if all redundant and irrelevant passages had been omitted), and it is obvious that this is utterly inadequate for dealing with both the systematic and bionomic aspects of British beetles of which we are told that 3630 kinds are known. Thus in a paragraph headed "Apion," various species of Attelabus, Apoderus and Rhynchites are mentioned, but there is no reference to the habits of these, which are amongst the most remarkable known in the British Coleoptera. The author on p. 13 unjustifiably complains of the neglect by British entomologists of the wonderful work of Fabre, but Fabre is not referred to again, and it is doubtful whether a single one of his discoveries relating to species within the scope of this book is mentioned. The four plates containing Mr. Hugh Main's beautiful photographs of living insects in various stages are excellent, but partly unintelligible for want of proper explanation. The outline figures of about 200 species of beetles will be of use to some to whom other books are inaccessible. Errors in the letterpress are too numerous to mention.

The Meaning of Animal Colour and Adornment. By Major R. W. G. HINGSTON. Pp. 411, with 40 figures in the text. (London: Edward Arnold & Co. 1933. 18*s.*)

IN this work Major Hingston develops a comprehensive theory by which he seeks to explain the diversity of colour and ornamentation among animals. The theory consists of two main parts:—(1) The traditional belief that in numerous groups conspicuous or striking colour and the form and arrangements of parts such as crests, beards, etc., are used for display in courtship, is incorrect. The purpose of these colours, etc., is intimidatory; they are used for challenging and scaring the rival or enemy. Their rôle is the same as that of the savage warrior's painted face, the scarlet tunic of the British Army of former times and (if the reviewer's memory serves him aright) of the tossing horsehair crest of the Homeric warrior. (2) The diversity of colour, pattern and arrangements of external parts—the striking and bizarre and the sombre and

cryptic—is the resultant of a conflict between the need for protection by assimilative and homochromatic coloration, etc., and the necessity for aggressive and intimidatory display to manifest itself in conspicuous colours and patterns. The one or the other type emerges according as the need for protection is slight or dominant. A species living in desert conditions (*e.g.*) cannot afford to be conspicuous, and therefore the majority of desert-animals are "protectively" coloured (Major Hingston does not mention Professor P. Buxton's discussion of this very complex problem). The "colour-conflict" may, however, be solved by *ad hoc* adjustments in a given species, *e.g.* the lion, in which a menacing and a cryptic arrangement of the hair exist side by side and can be put into play according to circumstances.

Major Hingston's concern with the problem of "colour conflict" is quite justifiable. Five years ago the writer of this review pointed out that such a dilemma was implicit in any theory of epigamic coloration. Students of evolution and adaptation need to face the difficulty of explaining in what circumstances an animal can afford to be conspicuous.

The greater part of the book is, however, devoted to proving that colours, ornaments and habits thought to be used for courtship-display are, in fact, intimidatory. The evidence is almost exclusively drawn from vertebrates and insects, and the author is at great pains to show that the postures and antics appropriate for displaying colour-patches and the like have, in fact, been observed or recorded. He also produces some evidence that alleged epigamic and display colours cannot have the effect claimed for them, as they are entirely disregarded by the female.

To those who have had any difficulty in believing that elaborate colour-patterns and ornaments could have been produced by sexual selection (operating either as outlined by Darwin or in the way suggested by J. S. Huxley), any alternative explanation is welcome. Unfortunately, Major Hingston's theory places almost as great a strain on our credulity as the older theory. There is, indeed, much of his evidence that is very suggestive, and one general principle which he develops certainly supports his thesis (viz. that it is in birds, in which aggressive display has largely replaced actual physical conflict, that such display is most highly developed). Nevertheless, much of the evidence is anecdotal, or based on inference or sheer supposition (p. 53: "There can be little doubt that when an ungulate watches his rival he will look . . . essentially at the joints of the legs . . . !"). To prove that a given colour or pattern has the assumed effect would need a very exact statistical study and a far more intimate knowledge of the animal mind than Major Hingston displays. To be just, he does supply (pp. 215, 218, 219) some evidence that enemies are scared by given colours, etc.—but such evidence is not very plentiful, and again it is anecdotal. Next, the author does not consider the occurrence of colour and ornament in animals in which no question of threatening behaviour can arise (*e.g.* Mollusca and Echinoderms). Lastly, he does not argue out the very important question as to how such threatening patterns, etc., are evolved. He does not think (p. 398) that natural selection can "generate new species." "The generating force is the vital impulse in the species itself." Major Hingston is not alone in preferring the activity of a vital impulse to natural selection as the chief causative factor in evolution. There is much evidence that animals are not the static victims of their environment. Evolution has been something more than a blind sieving of mutations. But Major Hingston should at least attempt to show how his assumed aggressive and minatory impulse gets translated into terms of heritable structure. Do birds and mammals produce the appropriate structural changes by their own efforts? From the main trend of his argument (Chapters II and III) we assume he believes

they do. Surely it is late in the day to profess a vague belief in "Lamarckian" effects without producing any evidence that they are possible.

Major Hingston writes briskly and forcibly; but some of his observations are rather childish. Does he really believe (p. 145) that in Man the brown pigment of the eye is a token of combativeness and the blue the result of the loss of that "battle-pigment"? If this were true, it would be sorry news for Herr von Papen and the "Blue-eyed Conquerors." Has Major Hingston not heard of the "Nordic" theory? It is a very great pity that no bibliography is given. Did it not occur to the author that his book (which is, after all, full of valuable data) might be needed for serious study? Lastly, why the constant reference to "*Mr.* Darwin"? If he is bent on honorifics, why does he not allude to "Dr. Darwin"? The celebrated investigator was an LL.D. !

Gulliver in the Bush. Wanderings of an Australian Entomologist. By H. J. Carter. Pp. viii + 234, with 20 illustrations on 9 plates. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 6*s.*)

The main title of this entertaining little book is not very informative; but it may be added that the author stands at least 6 ft. 2 in. in height, and is metaphorically also something of a giant amongst Australian coleopterists. The book is really a lively narrative of his many collecting expeditions to various parts of Australia, describing the scenery, the flora, incidents of the road, camp life, and so on, and from this point of view is very interesting to anyone unacquainted with Australian conditions. The entomologist will be frankly disappointed. Beyond the oft-repeated statement that so many new species of such and such a family were found here, so many there, there is little reference to insects. There are a few observations on habitats, and occasionally a brief discussion on distribution, but insects other than beetles are only referred to quite incidentally on one or two occasions. The book reads easily, is full of amusing anecdotes and grammatical errors, and is quite well produced.

The Cult of the Goldfish. By T. C. Roughley. Pp. xiii + 146, with a coloured frontispiece and numerous figures on 28 plates. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 6*s.*)

The timely appearance of Mr. Roughley's excellent book will be welcomed by all interested in the maintenance of aquaria or garden ponds. The keeping of fish in captivity provides at once a fascinating, instructive, and comparatively inexpensive hobby, and it is one which now numbers its devotees by hundreds of thousands. Of all fishes suitable for the aquarium the goldfish has ever been the most popular, and the many strange and even bizarre varieties produced by the Chinese and Japanese by selective breeding from the humble, olivaceous-hued fish found wild in eastern Asia should satisfy the most ardent aquarist. Some idea of the popularity of the species may be obtained from the fact that about 600,000 fish are exported annually from Japan, while in the United States, where the breeding of goldfish has assumed tremendous proportions within recent years, the annual production runs into about 35,000,000 fish. That this enormous production is, in part at least, correlated with a high rate of mortality among the fish in the hands of enthusiastic but inexperienced amateur aquarists cannot be denied. To keep fish alive and healthy is not a difficult matter provided certain definite principles are followed, and the beginner cannot go far wrong if he adheres to the instructions which are given in a clear and concise manner in the present work. Indispensable to all who are desirous of setting up and maintaining an indoor aquarium, or

of preparing and stocking a garden pool, this book should also provide a handy work of reference for the more experienced. Nor is its usefulness restricted to goldfish, for the general principles will apply equally well to the keeping of almost every kind of temperate fish as well as most of the tropical kinds.

After describing the origin of the domesticated varieties and entering a timely protest against the all too familiar "bowl of goldfish," the author outlines the principles of a balanced aquarium, and proceeds to deal in turn with the choice and construction of such an aquarium and its stocking with suitable plants and forms of animal life. As the book is intended primarily for Australian residents, the English reader will do well to bear in mind that some of the more detailed observations may require slight modification, and that some of the aquatic plants and animals may not be obtainable in this country. The different varieties of goldfish are next described, and a chapter dealing with their food and with the correct methods of feeding follows. The detailed treatment of the life-history of daphnids and mosquito larvæ should be of value to those aquarists who breed these extensively as food for their fish. Other subjects dealt with include the spawning habits of the fish and the development of the fry, the construction and maintenance of garden pools, animal pests in ponds, and the diseases and parasites to which the fish may be subject. The serious disease known as "white spot" or ichthyophthiriasis is dealt with in detail, and the life-history of the infusorian parasite and the treatment of the infected fish fully described.

The illustrations, most of them from drawings or photographs made by the author himself, are excellent, that depicting a "celestial" viewed from the front being particularly striking. It is perhaps unfortunate that some of the figures are separated by a number of pages from the corresponding text, but this is a minor criticism. The practical hints given in abbreviated form on page 138 should prove invaluable to the beginner, and the synopsis of diseases, their symptoms and treatment, is well done. There is an adequate index.

Fishes: their Journeys and Migrations. By LOUIS ROULE. Translated from the French by CONRAD ELPHINSTONE. Pp. x + 270, with 54 figures in the text. (London: George Routledge & Sons, Ltd., 1933. 12*s.* 6*d.*)

THE migrations of fish must always have been a subject of interest as well as a puzzle to mankind. The annual ascent of the rivers by the salmon and trout and the seaward procession of the silver eels would be familiar sights to the stone-age hunter, and to primitive man a rough knowledge of the seasonal appearances of the shoals of marine fish perhaps meant all the difference between famine and plenty. To-day, with the world dependent for a large part of its food supply upon the success of the great sea fisheries, a more exact knowledge of the movements of the shoals of food-fishes has become of paramount importance, and, as the result of mobilizing the combined resources of hydrographical and biological science, an enormous body of data relative to the subject has been accumulated. Much of this information is inaccessible, except to the student, and few of the textbooks dealing with fishes devote more than a few lines to their migrations (the word "migration" does not appear in the index to the volume on fishes in the Cambridge Natural History !). Apart from Meek's "The Migrations of Fish" (1916), inevitably out-of-date to-day, no modern summary of this fascinating subject has appeared in the English language, and the present volume, which sets out to tell in popular language all that is known about the courses and the causes of migrations, should go far towards supplying this deficiency.

In an introductory chapter Professor Roule summarizes the main con-

clusions of present-day biology relating to migrations. He points out that, although in some cases food may be the underlying cause of a particular journey, the principal migrations are nearly always concerned with breeding. He makes it clear that the comparatively localized movements of the shoals of marine fish, the short journeys undertaken by the brown trout, and even the movements of carp in a lake, are all of the same general nature as the more obvious and much more extensive migrations of the salmon or the eel. The old ideas of the vast concentrations of individuals of one species and of their almost boundless journeys through the oceans are shown to be erroneous in the light of modern knowledge, and are replaced by the conception of a number of localized or regional concentrations within each species. For example, the southerly trend of the great herring fisheries during the year is correlated with the appearance inshore of different shoals at various seasons, and not with the following of a single migrating horde as was formerly supposed. With regard to the causes of migrations, Professor Roule concludes that the compelling and guiding force is to be sought for, not in any mysterious extra sense or inherited racial memory, but in the nature of the environment itself coupled with the condition of the fish, that is to say, whether it is in a reproductive or non-reproductive phase. Thus, the salmon in the reproductive phase is urged to ascend the rivers by its ever-increasing need for water of high oxygen content, which in turn is often linked up with a low temperature. In the case of the shad the warmth of the water is held to be the all-important factor, as it is believed to be in the case of the tunny, whereas in the herring, although temperature plays its part in determining the movements of the shoals, the spawning migrations are related more to the degree of salinity of the water. This purely physico-chemical explanation of migrations appears to be fairly well established, although in some cases the evidence supplied by the author is not very convincing. It will not meet with the approval of those writers who would ascribe to fishes and other lower animals sensibility and power of reasoning akin to that of man, and who appear to be ignorant of the fact that the available experimental evidence suggests that fishes are capable of little more than the simplest of reflex actions!

After a short chapter on the brown trout, the next four chapters are devoted to the "marvellous story of the salmon." These may be recommended as providing a well-informed and interesting account of the life-history of this species, but the statement that the salmon spends its time in the sea in depths "where utter darkness reigns eternally," feeding on "swarms of red shrimps . . . [like] oxen being fattened, stuffing away in the darkness," is perhaps open to question. Chapters dealing with the migrations of the sturgeon, shad, herring, pilchard, mackerel, tunny, cod, gilt-head or dorade, mullet, bass and other fishes follow, and there is a full and well-written account of the life-history of the common eel. This fascinating story, the elucidation of which has provided one of the most interesting biological discoveries of the present century and which will always be associated with the name of the late Professor Johannes Schmidt, is here told with a wealth of picturesque detail.

Professor Roule is an official at the Natural History Museum in Paris, and, having made a special study of the migrations of fish extending over many years, is well qualified to write on the subject. The reviewer is bound to confess, however, to closing the present volume with a sense of disappointment. The primary object of a popular book on natural history, or, for that matter, on any other subject, must always be to arouse interest in the theme with which it deals, and in the main this book may be said to attain this object. Practically all the known facts concerning the migrations of fish are to be found within its pages, and the reader who has patience enough to disinter them

from the wealth of picturesque descriptive matter with which they are surrounded will not go unrewarded. Professor Roule indulges in a tremendous amount of repetition, and the frequent "purple passages," as well as the references to the "ways of nature," etc., will have a tedious effect on many readers. Others are likely to be irritated by the use, mainly for chapter headings, of such anthropomorphic terms and phrases as "wedding journey," "honeymoon journey," "husband and wife," "nuptial couch" and the like. Some of these faults, however, may be due as much to the translator as to the author himself. Mr. Elphinstone has followed the original closely, but the translation is sometimes very poor and reveals a certain degree of unfamiliarity with biological terminology. The rendering of "Puis, chez elles, avec l'âge adulte, arrive l'époque de la puberté" as "When the Golden Perch reaches adulthood it becomes pubescent," and the very unfamiliar use of the word "genetic," to describe a fish which is capable of reproduction, are glaring examples.

The figures in the text are well drawn and clearly reproduced, but the use of a greater number of sketch maps would have served to clarify the descriptions in the text and at the same time to enhance the value of the book. The absence of an index is to be regretted.

The Lamarck Manuscripts at Harvard. Edited by William Morton Wheeler and Thomas Barbour. Pp. xxxi + 202, with 4 plates. (Cambridge, Massachusetts: Harvard University Press; London: Humphrey Milford, 1933. 12*s.* 6*d.*)

The Library of the Museum of Comparative Zoology at Harvard College contains six holographic manuscripts of Lamarck. A translation of some paragraphs of two of them together with a general account was published by Dr. Bashford Dean in 1908, and they are alluded to in Landrieu's monograph on Lamarck issued in 1909. They are now reproduced in their entirety with a bibliographical and historical introduction and an English translation. The manuscripts consist of the following works: (1) An unpublished lecture on the "system" of Gall, who seems to be regarded at present alternatively as a speculative phrenologist or as a pioneer of cerebral localization; (2) Two articles on "L'Idée et l'Imagination," which were published in 1817 in Deterville's "Nouveau Dictionnaire"; (3) A short article entitled "Aperçu analytique des connaissances humaines . . .", an outline of a more elaborate work, published in 1820; (4) "Questions zoologiques," which seem to be a series of notes which may have been used at a later date, *e.g.* in the introduction to his "Animaux sans Vertèbres," published in 1835; (5) A short draft entitled "L'Histoire Naturelle," which was evidently a preliminary sketch of part of the first edition of the "Animaux sans Vertèbres"; (6) A brief account of a botanical excursion at Ville d'Auray in 1797, with a list of the plants he observed himself.

The student of Lamarck's career and intellectual development will find this work of no little interest. The scientific value of these essays is, however, open to question; but the editors have at least made them accessible to the student and our thanks are due to them for this service. The part of their introduction which involves a comparison between the theories of Darwin and Lamarck strikes one as a blemish in an otherwise praiseworthy piece of scholarship. Leaving the solid ground of bibliography and history they sail off into Adlerian psychology and give us five pages of highly questionable doctrine derived from a paper by Crookshank. In this we are invited to believe that Darwin elaborated the theory of natural selection as an "exteriorization of his neurotic excuses" for his own ill-adjusted life, while Lamarck's more

optimistic theory was the characteristic expression of the valiant soul, who was promoted on the field at Bergen-op-Zoom, and subsequently faced grinding poverty and the cares of fourteen children and four (or three, *fide* Landrieu) wives. It is, of course, impossible to criticize this thesis seriously in a short review. We can only express the belief that the evolutionary theories of Darwin and Lamarck stand in relation to their authors' neuroses, phobias, and complexes in general exactly as a wheelbarrow does to Wednesday week.

A Check List of North American Amphibans and Reptiles. By LEONHARD STEJNEGER and THOMAS BARBOUR. Pp. xiv + 185. (Cambridge, Massachusetts: Harvard University Press; London: Humphrey Milford, 1933. 18*s.* 6*d.*)

THIS, the third edition of the Check List, is essentially similar to its predecessors, but has been brought up to date by the inclusion of all the valid forms which have been reported from the United States and Lower California since 1923. In a praiseworthy attempt to achieve nomenclatorial stability the authors have refused to make changes unless absolutely compelled, but it is, perhaps, unfortunate that this conservatism has not allowed them to revert to names which were ill-advisedly changed in the previous editions or, in some instances, to accept the views of competent zoologists who have made special studies of particular groups. Nevertheless, the list is undoubtedly a very complete and useful guide to the herpetological fauna of North America, and will prove an essential reference book to all who are interested in reptiles or amphibians.

MUSEUM NEWS.

DR. F. W. Edwards spent six weeks during July and August on the Continent visiting the Museums of Helsingfors, Tallinn (Reval), Riga, Libau, Memel, Königsberg, Danzig, Stettin, Berlin, Dresden, Halle, Hamburg, and Amsterdam for the purpose of studying type specimens of Diptera, and also to collect Diptera in certain Baltic coast districts from which material was much needed.

Mr. W. H. T. Tams and Mr. A. W. Exell returned on April 1 last from their collecting expedition to the islands in the Gulf of Guinea. The islands of São Tomé, Principe, Fernando Po, and Annobon were visited, collecting being carried out on all of them.

Mr. A. H. G. Alston has recently returned from a botanical collecting expedition in Southern Albania, a district almost unknown botanically.

Mr. G. Tandy during the period May 31 to August 21 joined a group of investigators undertaking research at Dry Tortugas, Florida.

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Beginning in October 1932, special lectures or lecture-tours were given on Monday mornings by members of the scientific staff in place of tours by the Official Guide Lecturer. Most of them were delivered in the Board Room, in the absence of a lecture theatre, and were illustrated by lantern slides. The series was interrupted during the holiday months of August and September, and began again on October 2. The following is the current programme :—

October.

2. Dr. W. E. Swinton : Dragons.
9. Capt. J. G. Dollman : Convergent evolution in Mammals.
16. Miss M. R. J. Edwards : Man's debt to Animals.
23. Mr. J. Ramsbottom : Toadstools.
30. Miss E. Trewavas : Oceanic Fishes.

November.

6. Dr. Susan Finnegan : Spiders.
13. Mr. G. C. Robson : The causes of Evolution.
20. Mr. N. D. Riley : Mimicry in Butterflies.
27. Mr. M. A. C. Hinton : The Musk Rat menace.

December.

4. Miss D. Aubertin : Insects in relation to Man.
11. Mr. F. A. Bannister : Recent advances in Mineralogy : X-ray methods.
18. Mr. J. R. Norman : Sharks.
25. Christmas Day. Museum closed.

January.

1. Mr. M. Burton : Sponges and Sponge Fisheries.
8. Capt. J. G. Dollman : African Antelopes.
15. Dr. K. G. Blair : Luminous Insects.
22. Dr. Anna B. Hastings : The natural history of the English Lakes.
29. Mr. C. C. A. Monro : Parental care in Marine Worms.

With the exception of the third and the last, all the lectures will be given in the Board Room and will be illustrated by lantern slides. The time is 11.30.

* * * * * * * *

On May 4 the Trustees of the British Museum received in the New Whale Hall the delegates to the Centenary Celebration of the Royal Entomological Society of London. The Hall happened to be available, as the exhibition of the Game Animals of the Empire, which for some months had occupied it, had been removed from it, at least as regards the floor, for many of the heads still remained on the walls. For the purpose of the reception a platform had been placed in the middle of the west wall, under the gallery. The company present numbered altogether 166.

The delegates were welcomed by the Rt. Hon. the Earl of Crawford and Balcarres, K.T., on behalf of the Trustees, and the other members of the Board present were the Earl of Ilchester, O.B.E., Lieut.-Col. Sir David Prain, C.M.G., C.I.E., F.R.S., and Sir Henry A. Miers, F.R.S. The Chairman had on his right on the platform Prof. E. B. Poulton, F.R.S., President and Honorary Life President, Royal Entomological Society, and on his left Dr. E. C. Van Dyke, one of the foreign delegates. On Prof. Poulton's right was the Director, Dr. C. Tate Regan, F.R.S., and at the other end of the front row was Dr. S. A. Neave, O.B.E., Assistant Director, Imperial Institute of Entomology, and Honorary Secretary, Royal Entomological Society. In the row behind, besides the three Trustees, were Sir Guy A. K. Marshall, C.M.G., F.R.S., Director, Imperial Institute of Entomology, and Dr. W. T. Calman, F.R.S., Mr. N. D. Riley, and Dr. G. F. Herbert Smith.

Lord Crawford said that in the unavoidable absence of the Archbishop of Canterbury, Chairman of the Board of Trustees of the British Museum, he had been appointed to preside that afternoon and on their behalf to offer the delegates a hearty welcome to that great National Museum. They felt a quasi-paternal interest in the fortunes of the Society, for it was founded in J. G. Children's official apartments in the old building of the British Museum at Bloomsbury. He gave particulars of the close connexion which had always obtained between the Museum and the Society. Lord Crawford commented on the great change in the public attitude towards entomology which had

occurred since his young days, and asserted that now it was the most conspicuous and most important of the many divisions of zoology. The expansion of the accommodation for the Entomological Department had been provided by the Empire Marketing Board, and they hoped that, as recommended by the Royal Commission on National Museums and Galleries, that accommodation, which was intended ultimately for the collections in spirit, would be replaced before many years by a new building on the site of the old Whale building.

Prof. Poulton in his response said that it was his pleasant duty on behalf of the Royal Entomological Society of London to offer their warmest thanks to the Trustees of the British Museum for their delightful reception and to Lord Crawford for his most friendly welcome. The help and encouragement which they had invariably received from that august institution began with their birth, and this association, which had continued, had proved of immense benefit to the Society and, he thought, of some value to the Museum. For some years a common link had been provided by the Imperial Institute of Entomology, which had one home in the Museum and another in the Society's building. Formerly, the Society was lodged at Chandos Street; but, when the natural history collections were transferred to South Kensington, the Society could not bear to be left behind and soon followed. The reception that afternoon was a most happy omen for their second centenary.

Dr. Van Dyke, who spoke for the foreign delegates, remarked that ever since his earliest boyhood the British Museum had been in his mind, and it was a great pleasure to be present on that auspicious occasion. The Museum had always been most catholic in its service; students were given full liberty with very limited restrictions, with the result that it had become the Mecca for students in all parts of the world.

Dr. Regan said that, speaking on behalf of the Museum Staff, they were glad to welcome the delegates and the Officers of the Royal Entomological Society of London. The advantage of scientific work was that apart from its own interest it enabled one to make so many friends, and the Museum had friends in all parts of the world.

At the east end of the Hall a series of entomological specimens and publications of historical interest was on view.

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THE PROTECTION OF THE FAUNA AND FLORA OF AFRICA.

By Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

At the recent International Conference for the Protection of the Fauna and Flora of Africa, held in London from October 31 to November 8, 1933, the following Committee was appointed to draw up the list of animals and plants which were in need of protection :—

Sir Arnold Hodson, K.C.M.G., *Chairman*.

Union of South Africa .	Sir Arthur Hill, K.C.M.G., F.R.S.
Belgium	Dr. Van Straelen. Dr. Jean Derscheid.
Great Britain and Northern Ireland .	Mr. W. J. Bigg. Captain Keith F. T. Caldwell. Dr. Percy R. Lowe, O.B.E. Captain R. J. D. Salmon.
Egypt	Dr. Ibrahim Kadry.
Spain	Don José Da Casa Calzada.
France	Professor Bourdelle. M. G. Petit.
Italy	Marchese Saverio Patrizi. Professor Edoardo Zavattari. Professor Isaia Baldrati.
Portugal . . .	Dr. Luis Wittnich Carisso.
Anglo-Egyptian Sudan .	Major W. R. Barker.
Joint Secretaries .	Captain Guy Dollman. Mr. D. H. F. Rickett.

The Committee was instructed to divide the list into two Classes, A and B. Animals belonging to the species mentioned in Class A were to be protected as completely as possible; the hunting, killing or capturing of them was to take place only by ... [illegible] of the highest authority in the territory, ... [illegible] was to be given either in order to further ... [illegible] purposes, or when essential for the admin-

istration of the territory. Animals belonging to the species mentioned in Class B, whilst not requiring such vigorous protection, were not to be hunted, killed, or captured, even by natives, except under special licence granted by the competent authorities. For this purpose a special licence was accepted as denoting one other than an ordinary game licence, to be granted at the discretion of the competent authority, and giving permission to hunt, kill, or capture one or more specimens of a specified animal or specified animals, and every licence was to be limited as regards the period and the area within which hunting, killing, or capturing should take place. The deliberations of the Committee were thorough and extensive; three meetings were held before the delegates and their advisers agreed upon the items of the Annex, which was then accepted by the Conference without criticism.

In Class A there occur seventeen entries dealing with Mammals, and three with Birds; there is also included in this Class the only plant recommended for protection, the Welwitschia (*Welwitschia Bainesii*). Among the Mammals it comes as no surprise to find the gorilla taking first place, all races, both of Western and Eastern gorillas, being included. One hears a great deal about the persecution of the Eastern gorilla, but there can be little doubt that the Western race or races are still more persecuted, especially by the natives.

At the suggestion of the French Delegation all the lemurs of Madagascar were placed in Class A, that is the family Chiromyidæ, including the aye-aye only; the family Lemuridæ, including the typical lemurs, the sportive lemurs, the gentle lemurs, the mouse lemurs, and the dwarf lemurs; and the family Indrisidæ, including the woolly lemur, the sifakas, and the endrina. It became necessary to include the three family names in the Annex, because otherwise, if the subordinal titles Chiromyoidea and Lemuroidea had been used, it might have given rise to some confusion, as there are two groups of African Lemuroidea, the pottos and galagos, which were not intended to receive protection.

Among the Carnivora we find two entries in Class A, the aard wolf (*Proteles cristatus*), and the fossa (*Fossa fossa*), another member of the fast disappearing fauna of Madagascar.

In the order Ungulata occur all the other mammalian entries in Class A. First on the list of this order comes the name of the giant sable antelope (*Hippotragus niger variani*), which was proposed by the Portuguese Delegation. Seeing that this fine antelope is only found in a very restricted area in Angola and that it has during the past fifteen years been keenly hunted,

the necessary protection has not come too soon. The nyala (*Tragelaphus angasi*) and mountain nyala (*Tragelaphus buxtoni*) were also included in Class A, and what has just been written about the giant sable is even more true as regards the mountain nyala. This magnificent antelope was discovered by Mr. Ivor Buxton in the Sahatu Mountains of Arusi Gallaland in the year 1910. It was never very numerous, and as it was restricted to its mountain home, its persecution resulted in nearly all the males being shot; it remains to be seen whether the Conference has come soon enough to save this fine species.

The okapi (*Okapia johnstoni*), Barbary stag (*Cervus elaphus barbarus*), pigmy hippopotamus (*Chœropsis liberiensis*), mountain zebra (*Hippotigris zebra*), wild ass (*Asinus asinus*), white rhinoceros (*Rhinoceros simus*), Abyssinian ibex (*Capra walie*) and water chevrotain (*Hyemoschus aquaticus*) were all placed in Class A; when a species is represented by two or more sub-species, all the sub-species are included in the list, unless, as in the case of the Barbary stag, a special race is mentioned.

Another rare animal which received sympathetic treatment by the Committee was the bubal or northern hartebeest (*Bubalis buselaphus*); this antelope, being so rare that many authorities regard it as extinct, was obviously a case where the Conference should extend such help as was possible.

Finally, the elephant was dealt with under both Class A and Class B. The " A " elephants include only animals in which the tusks do not exceed 5 kilograms in weight each, and the " B " elephants are specimens in which the tusks exceed that weight.

Three birds were placed in Class A:—the whale-headed stork or shoe-bill (*Balæniceps rex*), the bald-headed ibis, or waldrapp (*Comatibis eremita*), and the white-breasted Guinea fowl (*Agelastes meleagrides*). The reason for the inclusion of the latter species in Class A seems a little obscure, but the Italian Delegation held strongly to the view that this bird should be protected and it was finally included among the " A " species.

In Class B there are thirteen entries dealing with Mammals, and nine with birds. Amongst the Mammals there are two entries under the order Primates, the chimpanzee (including all races), and all forms of colobus monkey. Thus, in the latter genus (*Colobus*) we shall have protection not only for the black and black-and-white colobus, but also all the red colobus monkeys, that is all sub-species of *Colobus badius*.

The remainder of the Mammals in Class B, with the exception of the pangolins, are all Ungulates, commencing with the much sought after giant eland or Lord Derby's eland (*Taurotragus

derbianus), the protection to be extended to all three sub-species; thus the western or typical race, the Congo form, and the giant eland of the Sudan are all included under this heading. There are six further entries in this class dealing with antelopes, of which, perhaps, the most deserving are the white-tailed gnu or black wildebeest (*Connochœtes gnou*), and the bontebok (*Damaliscus pygargus*), both of which species have been reduced in number from the countless thousands which roamed the plains of South Africa in the early part of the nineteenth century to a few herds kept in a state of semi-domestication on certain South African farms.

The yellow-backed duiker (*Cephalophus sylvicultrix*) and Jentink's duiker (*Cephalophus jentinki*) were included as being rare species, while two further rare antelopes, the beira (*Dorcotragus megalotis*) and the dibatag, or Clarke's gazelle (*Ammodorcas clarkei*), both from Somaliland, were considered by the Committee to be worthy of positions in Class B. The beira and the dibatag are not only rare animals but are also the objects of much speculation concerning their natural affinities.

All giraffes were placed in the "B" list, as also was the black rhinoceros; this latter species, although plentiful enough in some parts of Africa (in certain districts in East Africa these animals are a pest), is rare in other parts; it was pointed out by the French Delegation that the black rhinoceros was a very rare animal in some of the French territories and it was accordingly agreed to include the species in Class B.

After the Ungulates we have a single entry, under the heading Edentata, to include all the species of pangolins, or scaly anteaters, of the genus *Manis*. The inclusion of these pangolins was necessary because the horny scales from their skins were being used in parts of Africa as a kind of native currency.

The most important of the birds in Class B are the four African sub-species of ostrich (*Struthio camelus camelus*, *S.c. australis*, *S.c. massaicus*, and *S.c. molybdophanes*, these four races being included under one number. The secretary bird (*Sagittarius serpentarius*), the marabou (*Leptoptilos crumeniferus*), and four species of egret: the little egret (*Egretta garzetta garzetta*), the African great white egret (*Casmerodius albus melanorhynchus*), the African yellow-billed egret (*Mesophoyx intermedius brachyrhynchus*), and the buff-backed heron (*Bubulcus ibis*).

With the exception of the elephant, black rhinoceros, white rhinoceros, giraffes, and some of the lemurs and colobus monkeys, all of the Mammals together with four of the Birds in the Annex are illustrated in the *Supplement*, pp. xxxiii–xl.

A VISIT TO THE ISLANDS IN THE GULF OF GUINEA.

By W. H. T. TAMS, Assistant Keeper, Department of Entomology.

(*Continued from p.* 137.)

We returned to a deserted native shelter in a large clearing known as Estacão Souza (5230 feet), and in leaving this we must have taken the wrong path; for we soon found ourselves in strange surroundings. This was before midday, and we had brought no food from our camp. It took us till dusk to find Estacão Souza again, and it would have been too dangerous to cross the *escadas* in the dark, so we slept—intermittently—in wet clothes in a bed made of bracken laid on poles, with a cold wind blowing up over the edge of the precipice to the south of us. Up at 5.30 next morning, we set out to try again. We had to cross three huge ridges before we struck the Calvario ridge, and after we had struggled up on to the crest, we had to face the *escadas*. We safely negotiated these, and were proceeding along, happy to be on our way to our camp but very tired, when we found that our path, which was a six to ten feet wide ledge on the face of the precipitous mountain wall, was completely blocked by a fall of earth and trees. Neither of us will ever forget that last obstacle. Mr. Exell found on the *escadas* what we thought was an orchid, but it has turned out to be *Utricularia bryophila*, a bladder-wort.

The other spot in São Tomé that proved very fascinating from a botanical point of view, but not exciting entomologically, was Lagôa Amélia, once a crater lake, now a swamp across which we were able to walk (Figs. 13, 14). The high crater walls were densely clothed with vegetation, with here and there a large clump of tree-ferns (*Cyathea*) near the bottom and some magnificent begonias on the crater rim. We made three trips to this delectable spot. The first time we set out at 7.0 a.m.; at 9.30 a.m. it started to rain and we arrived back at Vanhulst soaked. The rain continued to the late afternoon. Each day for about a week after our arrival at Vanhulst the rain started about 10.30 a.m.–11.30 a.m. and kept on for two or three hours. Later it became much more irregular, starting late and sometimes keeping on till the late evening, but it seemed always fine at night. Our third visit to Lagôa Amélia turned out wet, and I caught hardly anything. That night a storm started to blow up, and continued to do so all night, breaking at 9.0 a.m. next day with terrific

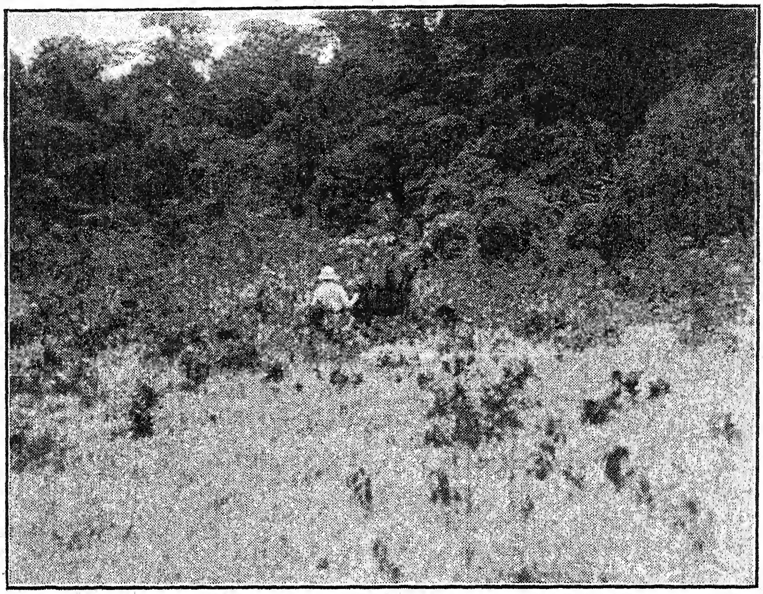


FIG. 13.—LAGÔA AMÉLIA, SÃO TOMÉ.

FIG. 14.—LAGÔA AMÉLIA, SÃO TOMÉ.

violence; Mr. Exell was out in it. In the evening we had a wonderful view of Principe, 90 miles away, and a friend, Senhor Saldanha, whom we visited at Roça Saudade (Fig. 15) next day, told us that in twenty-four years he had never seen a similar phenomenon. A week later we said farewell to Vanhulst (Fig. 16). By this time I had obtained a fairly good collection of moths, including a male *Streblote thomensis*, a Lasiocampid of which only the type male in the British Museum is known, a long series (over 120 specimens) of *Chionaema*

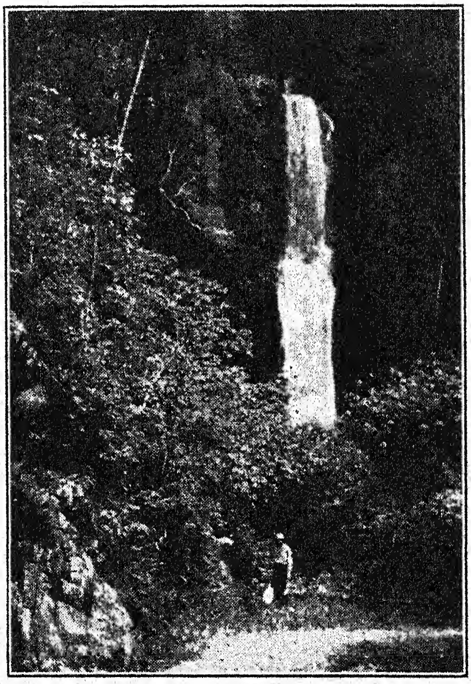


FIG. 15.—WATERFALL NEAR ROÇA SAUDADE, SÃO TOMÉ.

rufifrons previously represented in the British Museum collection only by a drawing; and a number of interesting Pyralidae and Geometridae. On Sunday, November 27, the day on which we were due to leave Zampalma (Figs. 17, 18) for the *cidade* (city), I went to the very beautiful Roça Traz-os-Montes, where there were fine horses and cattle, and a magnificent plant for producing *aguardente* from sugar-cane. Machinery for handling coffee stood in a building alongside a stream, on the other side of which stood the building containing the sugar-cane crushing machinery, vats, still, etc. The stream turned a huge water-

wheel and the power could be transmitted to either of the buildings as desired. An interesting fact connected with the name Traz-os-Montes (Behind the Mountains) is that it is taken from that of the only Portuguese province that does not touch the sea, the province whence came Fernão de Magalhães (Ferdinand Magellan), who was the first navigator to sail round the world.

After a few days at the Cabo Submarino alone—Mr. Cauvin having gone on a tour of inspection to Principe—during which we made an automobile trip through the Roça Agua Izé (Fig. 19)

FIG. 16.—FOREST AT VANHULST, SÃO TOMÉ.
Coffee plantation in foreground.

to the Rio Io Grande, we succeeded in getting away on the Portuguese boat "Lourenço Marques" to Principe, where we received a wonderful welcome, Mr. Cauvin having prepared the way in a manner that took one's breath away. Dr. Antonio de Mantero (Director of the Roça Porto Real), who was leaving for Europe on the boat which had brought us, took us up by the little Decauville Railway to his main Roça Esperança (Figs. 20, 21), where we discussed possibilities and the arrangements that he had in view, in order that our visit should be made as successful as possible. The result was that we were able, through the kindness of Senhor Francisco Esteves (Administrator at the Roça Sundi) and his brother Senhor Raimundo

Esteves (to whom we had introductions from Prof. Carrisso), who joined forces with Dr. Mantero, to stay for twelve days at Terreiro Velho (Figs. 22, 23), and about ten days at Esperança. A very delightful and profitable stay at the Roça Infante Dom Henrique in the south of the island we owed to the generosity of Senhor J. Brito (of the Companhia da Ilha do Principe), who was temporarily in charge there.

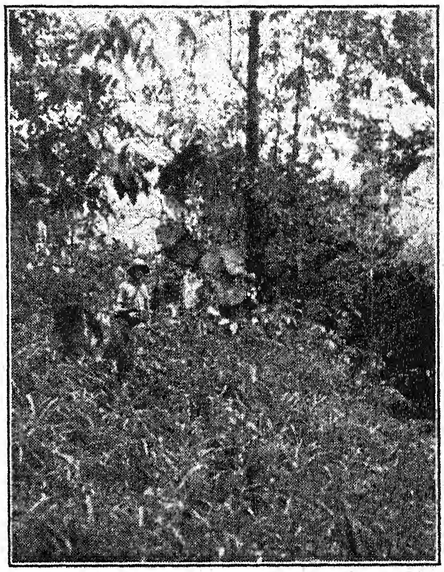


Fig. 17.—A fine Begonia above Zampalma, São Tomé.

Butterflies were more common in Principe than in São Tomé, but they were not very exciting. Moths at Infante Dom Henrique were more plentiful than at either Terreiro Velho or Esperança. Where the Decauville track came down close to the town was the only spot at which I saw butterflies congregated at mud, and the only butterfly there was a little Lycaenid, which was present in such enormous numbers that when I dropped a glass-bottomed pill-box (an inch and a quarter in diameter) over the drinking insects I imprisoned twelve. Along the same piece of track during the last few days of our stay in Principe, I found that a beautiful Papilio was attracted to mule droppings, and by dint of strenuous efforts I succeeded in getting three specimens before we had to leave.

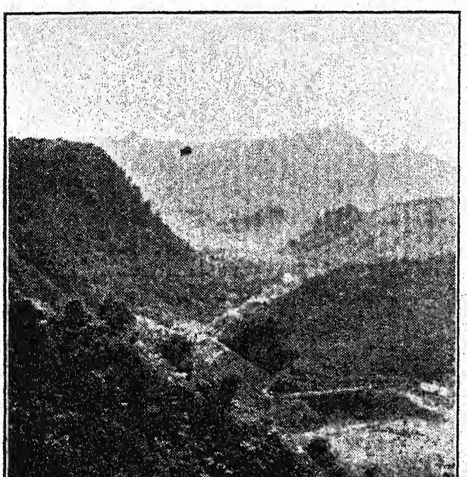


Fig. 18.—Valley of the Roças Nova Ceylão, Traz-os-Montes, and Zampalma (last two hidden), São Tomé.

Our stay at Terreiro Velho was not as productive of insects as of plants. I took some butterflies, including some Acraeas, and a number

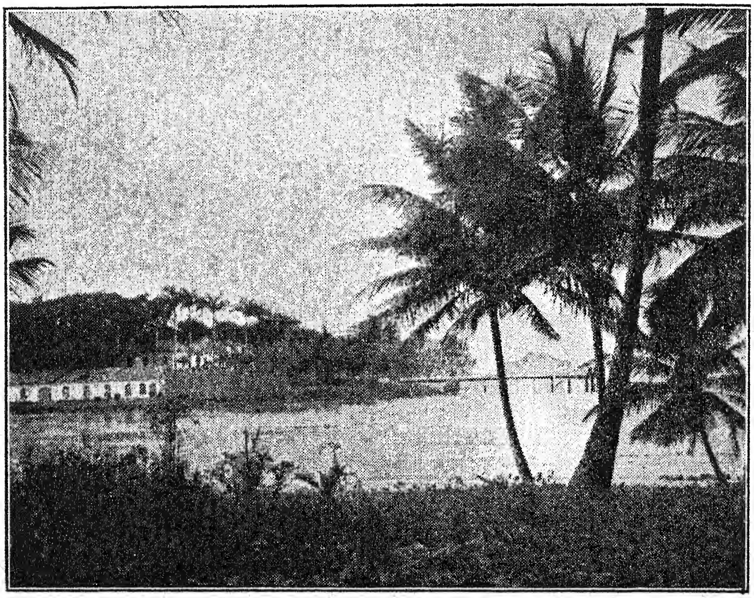


Fig. 19.—Roça Aqua Izé, São Tomé.

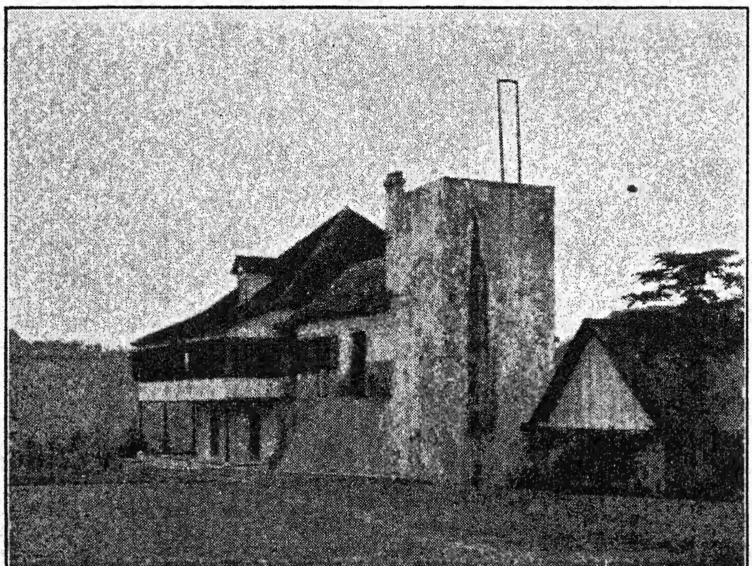


Fig. 20.—Roça Esperança, Principe.

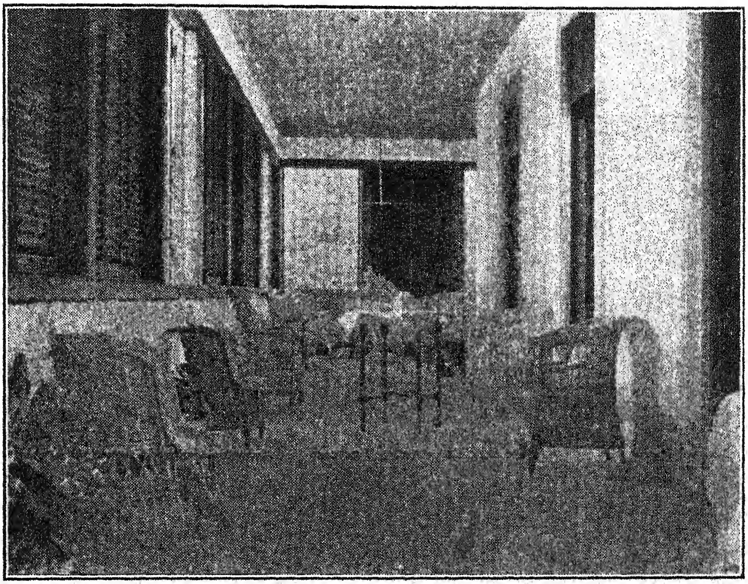


FIG. 21.—VERANDAH AT ESPERANÇA, PRINCIPE.

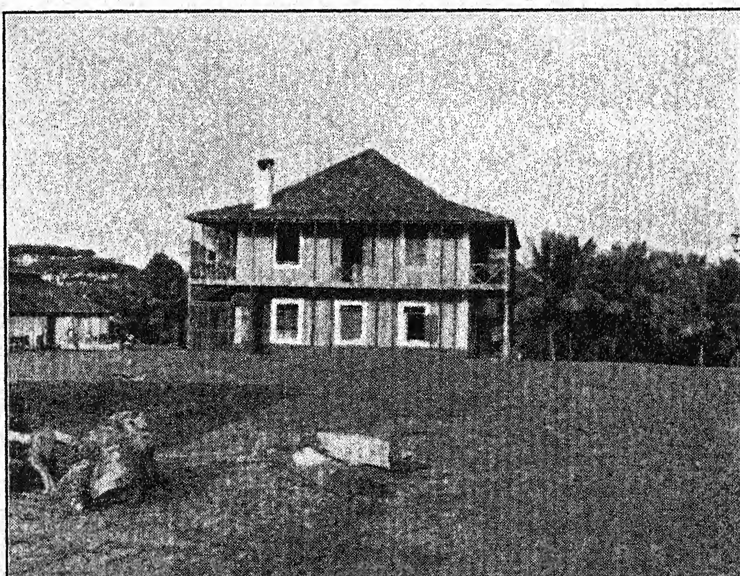


FIG. 22.—ROÇA TERREIRO VELHO, PRINCIPE.

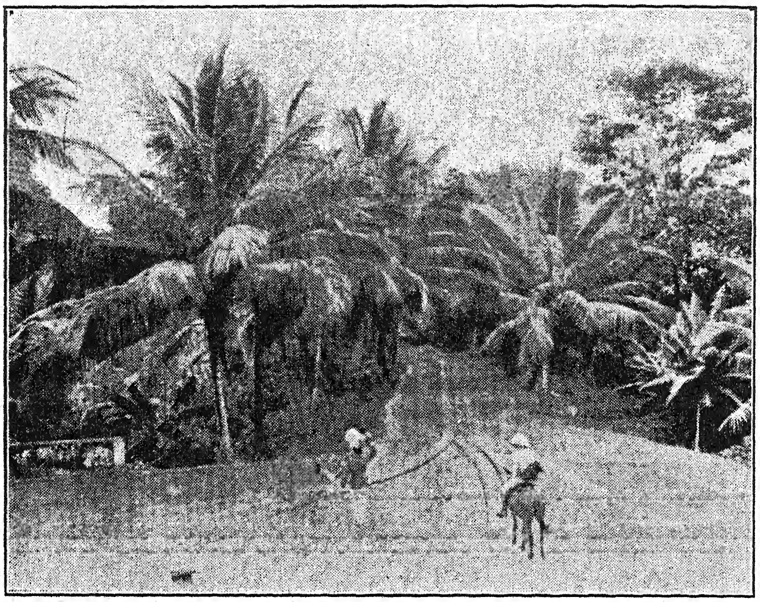


Fig. 23.—Road to the *cidade*, Terreiro Velho, Principe.

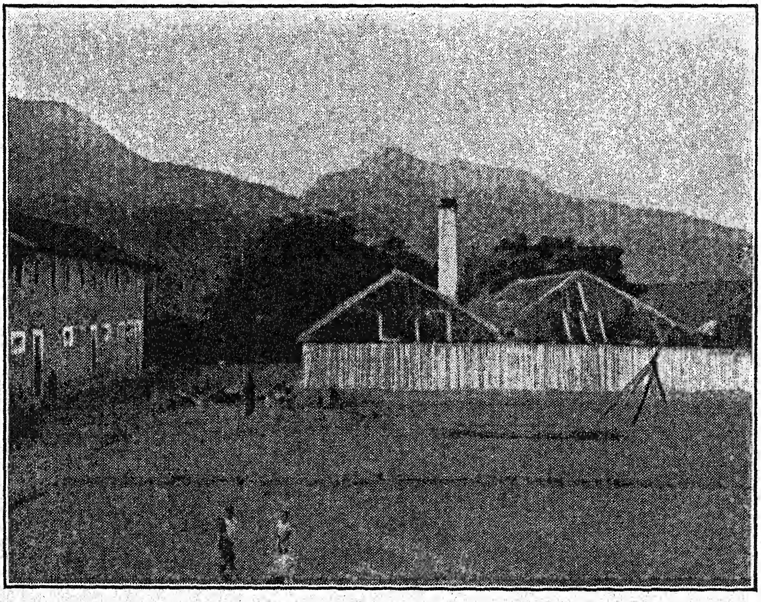


Fig. 24.—Terreiro Velho, Principe: view towards Oque Pipi, with Pico do Principe in the Distance.

of other butterflies and insects of other orders between Terreiro Velho and the top of a near-by hill named Oque Pipi (1100 feet) (Fig. 24). I set up a tent on Oque Pipi, where I tried working light at night, but neither there nor at the house did I have any success. Fig. 25 shows the epiphytic orchid *Cyrtorchis acuminata* (Rolfe) Schlecht., a very beautiful plant peculiar to Principe.

Fig. 25.—Epiphytic Orchid (*Cyrtorchis acuminata*).

On December 17 Senhor Francisco Esteves and his wife gave us a delightful day at the great Roça Sundi, and drove us to three dependencies of the roça, giving us a good idea of the enormous extent of this property.

At the Roça Infante Dom Henrique (Fig. 26) we spent five days, and these proved most successful, insects being fairly plentiful and moths coming freely to light at night. This south-east corner of the island (Fig. 27) was most interesting,

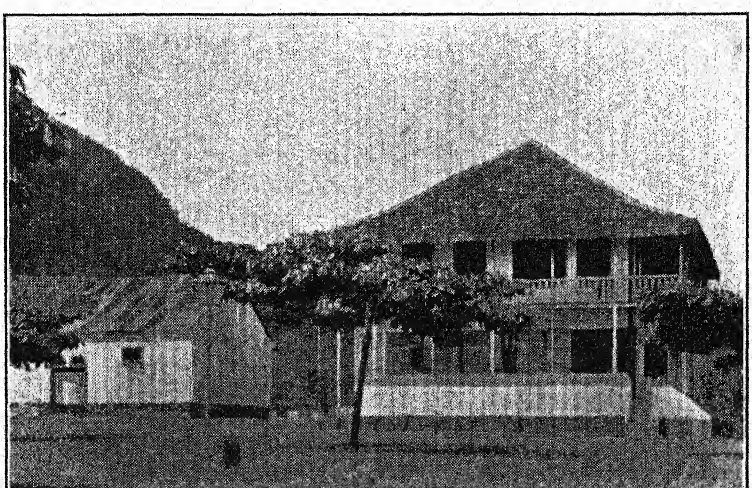


Fig. 26.—Roça Infante Dom Henrique, Principe.

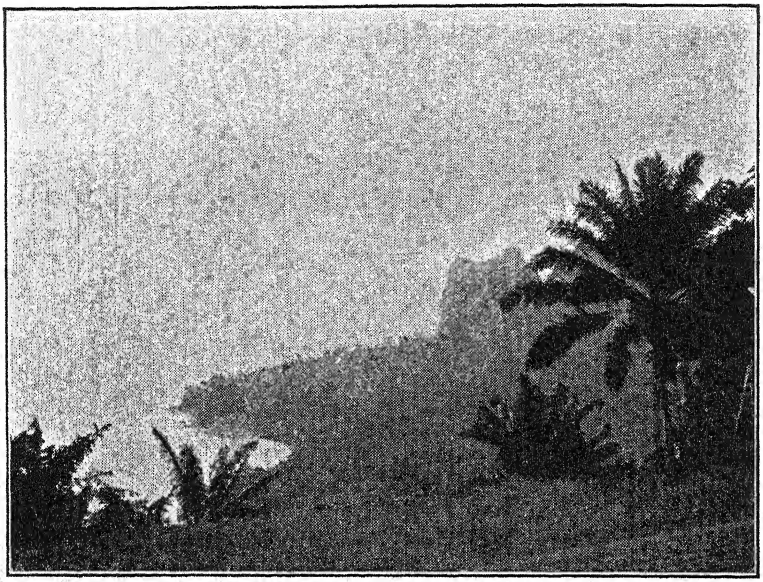


Fig. 27.—South-east corner of Principe.

Fig. 28.—Vegetation on Basalt, Principe.

and I was afterwards sorry that I did not bring away some of the rock. The formation of the basalt is shown in Fig. 28; there were many exposed basaltic rocks similar in appearance to this, and some of them were complete rock-gardens in themselves, a species of *Calvoa* with magenta flowers being especially abundant.

On December 23 (Fig. 29) we reluctantly left Senhor Brito for the *cidade*, where car and mules were waiting to take us to the Roça Esperança. We owe a great debt of gratitude to Senhor Simões, the "administrador" of this Roça, for his

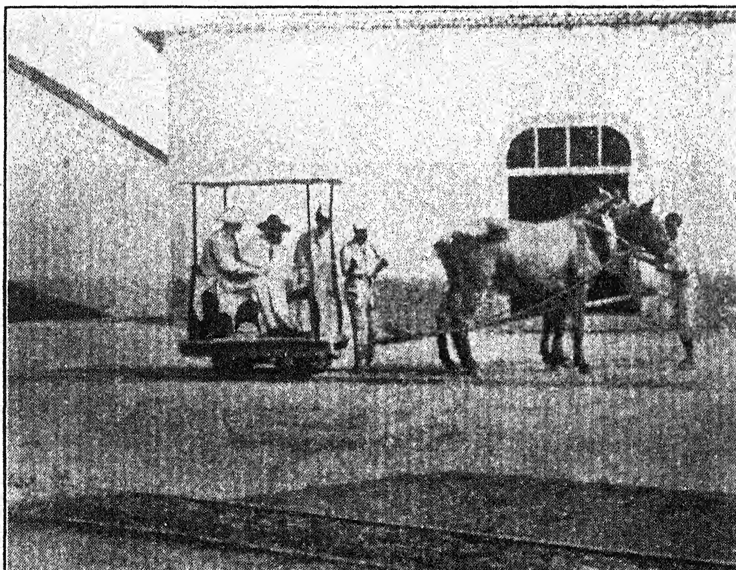


FIG. 29.—TRANSPORT IN PRINCIPE.

kindness to us during the rest of our stay in Principe. He enabled us not only to carry out our excursions effectively, but also made it possible for us to accept the invitation of the Administrador-General of Principe (Tenente M. B. da Fonseca) to dinner on Christmas night, an entertainment which we shall not readily forget, for, although Tenente da Fonseca only spoke his own language, he made it very clear to us that we were not to feel any sense of loss or loneliness if he and his wife and daughter could do anything to prevent it. We are not ungrateful to him. During our ride down to the *cidade* that night we were derailed three times owing to a broken spring on the car, but, by inducing our native "conductor" to turn the car

round and run it backwards, we reached the city level safely (Fig. 30). The ride back, drawn by two fast mules, was quite as exciting with a native standing by the driver holding out a stable lamp to illuminate the track.

The fact that there was no Englishman on Principe made no difference to us; for the two Africans in charge of the Cable Station, Mr. J. Forster Cole and his assistant Mr. F. E. Wright, spoke English and Portuguese so perfectly that they were able to do us many a good turn, and we were always sure of a warm

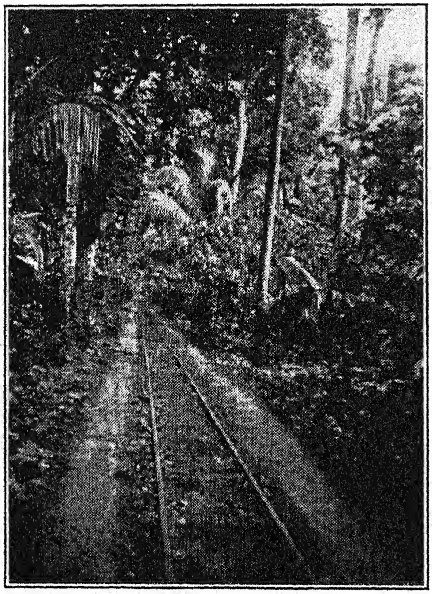


Fig. 30.—Decauville track through Plantations to Esperança, Principe.

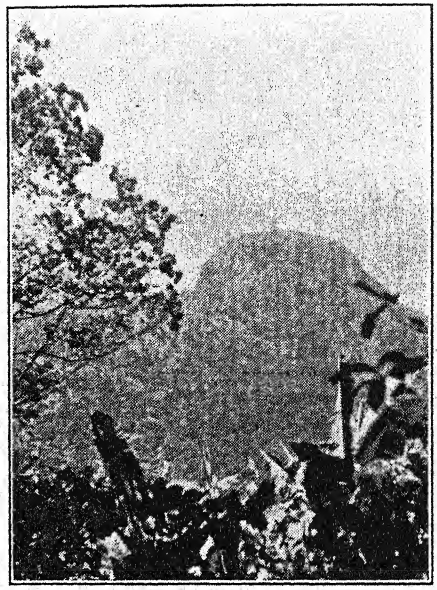


Fig. 31.—Morro Papagaio, Principe.

welcome from them whenever we went to the town. We recall their kindness with pleasure and gratitude.

On Thursday, December 29, we planned a trip to the top of Morro Papagaio (Fig. 31), and we asked Senhor Simões if we might have some sandwiches and bananas. He insisted on sending our *almoço* up after us, and I think it should be placed on record that not long after we arrived at the summit (about 2200 feet), carriers arrived bearing a hot five-course luncheon, which they proceeded to lay out properly, complete in every detail, and it says something for the climate that fried eggs arrived quite hot on the top of the peak.

Our departure from Principe was almost headlong. We had a preliminary warning of the possible arrival of a boat

about January 2, 1933; so we cancelled a proposed excursion for that day and packed instead, and thereby escaped being caught in a tornado on Pico Mesa, as well as missing the boat. On Tuesday no boat or news of one having appeared, Mr. Exell went down to the *cidade* to pack plants for dispatch to Europe, while I climbed Papagaio to get some rock specimens. At 3 p.m. I was 1000 feet above Esperança, and from my high view-point could see the city and the harbour, without any sign of the expected ship. Having gathered the pieces of rock I wanted, I returned to Esperança, to find Mr. Exell back from

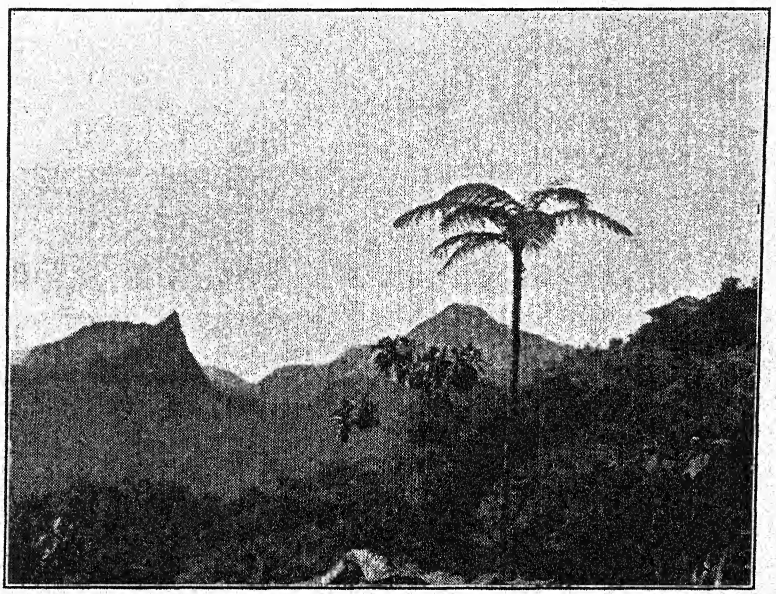


FIG. 32.—TYPICAL SCENERY IN SÃO TOMÉ.

the city with the news that the boat was expected at 6 p.m., and that we were to go down at once to the *cidade*, where Messrs. Forster Cole and Wright were expecting us to join them at the Cable Station for dinner. Fortunately our packing was practically complete, and we had only to lock up and have our baggage loaded on the two Decauville cars, say farewell, mount our passenger car, and off we went on our exciting half-hour journey to the city under our own weight. While we were at dinner the Administrador-General, Tenente Fonseca, came in to offer us the use of his *gazolina*, a kind act of which we gratefully took advantage, although our friends at the Cabo Submarino had arranged to row us out in their own

boat. The next morning, January 5, we were back in São Tomé, where we remained till January 11, when we reluctantly said good-bye to Mr. Cauvin and the truly beautiful island (Fig. 32) where we had spent so many happy hours in his company.

We left on the steamship "Muansa," bound for Libreville, in the hope of getting a boat on to Fernando Po. The Governor of the French Congo had kindly accorded us permission to land at Libreville, but we did not avail ourselves of this courtesy, as we found lying at anchor there the Chargeurs Réunis boat "Amérique," and we were successful in transferring direct from one ship to the other. The French boat took us to Suelaba at the mouth of the Cameroon River, where we again transhipped, this time to a queer river-boat, the "Fullah," which took us up the Cameroon River to Duala. The river banks exhibit miles of a uniform growth of mangroves. The lower deck of the "Fullah" was crowded with natives bound for Duala and Haussa merchants selling trinkets. Here we were stranded for nearly a fortnight, unable to do any work because we were compelled to remain in the town in order to find some means of getting across to Fernando Po. We would both have liked a trip to Yaunde by rail and a trip by launch to Tiko in the British Mandated Cameroons, but having to send radiograms and wait for the replies, and being compelled to keep an eye on all incoming boats, made a two days' absence impossible, and when we finally got news of a boat through the kindness of the Acting Governor-General of Spanish Guinea, our time was filled up with making arrangements to get away. We made one trip by car, when we were finally ready, to the Japoma, on the Dibamba or Lungasi River, which was the scene of much activity during the Great War. Two days' delay, and then at last we set off in a *chaloupe*, or launch, the "Conscolsa," for Fernando Po. We arrived at Santa Isabel (Fig. 33) at 5 a.m. on January 26, and were met by the Governor-General's interpreter, Señor Perez, and two Spanish medical entomologists, Dr. F. Bonet Marco and Dr. Juan Gil Collado. Our two new entomological friends carried us off at once to their hotel. As soon as they knew what we wanted they found out the possibilities, and we decided to leave early next morning by launch for Concepcion in an attempt to get up to Moka. We found that a Spanish boat, the motor-vessel "Plus Ultra" (Fig. 33), was to leave Santa Isabel on February 8 for Annobon, and this left us time, if we caught the launch "Emma" early on the morning of January 27, to put in five or six days at Moka.

We had therefore an exceedingly busy day when we arrived at Santa Isabel, having to divide our baggage at the Custom House into two lots, and then to go to the Passport Office and report to the Police, and to the Mision Especial de Endemias for a *pasaporte medico* which necessitated a blood test for sleeping sickness. Dr. A. Lloret, who examined us, came down to Concepcion with us the next day, as also did one of the medical entomologists. In addition, we had to go to the Bank of British West Africa for our letters and some Spanish money,

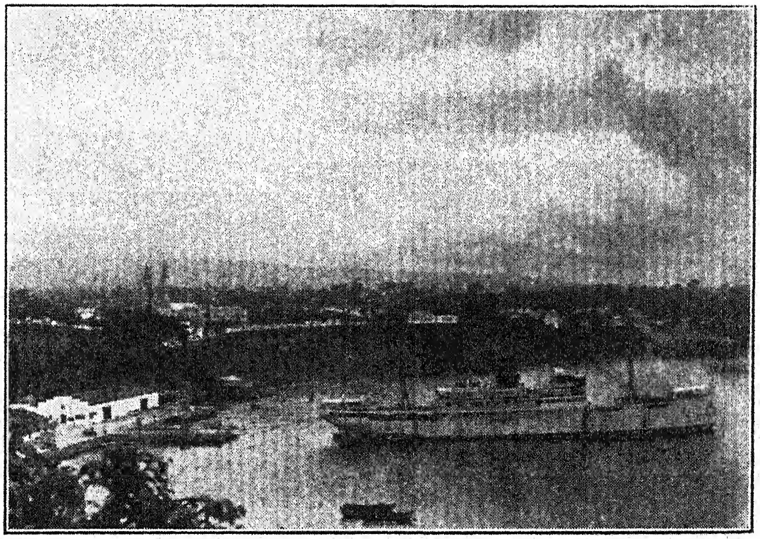


Fig. 33.—Santa Isabel, Fernando Po.
Motor-vessel "Plus Ultra" in harbour.

and here we made the acquaintance of the manager, Mr. C. W. Chew, the British Vice-Consul, to whom we were afterwards indebted for much kindness and help. Next morning we went down to catch the launch and were astonished to find porters busy putting on the boat the baggage we did not want, and nobody seemed to know where the other was. Ultimately we found that our packages were already in the small hold of the launch and off we went. We had with us an escort, a West Coast native policeman (Fig. 43) kindly provided by the Governor-General. He spoke English, French, and Spanish, and proved an excellent servant. The run to Concepcion occupied about eight hours, and we had an opportunity of seeing the nature of the beautiful east coast of the island, dotted with *finkas*, which are the Spanish equivalents of the *roças* of the

Portuguese islands. They have a striking feature not possessed by the *roças* in São Tomé and Principe, in the chimney of the drying-house, which is a tall cylindrical structure. On our arrival at Concepcion, where one is carried ashore by natives from surf-boats (Fig. 46), Dr. Lloret, in order that we should lose none of the short time available to us, commandeered the Chevrolet motor truck which General Luis Valdes (Fig. 45) had sent down for various consignments he expected from Santa Isabel, had us and our effects loaded thereon and sent us off

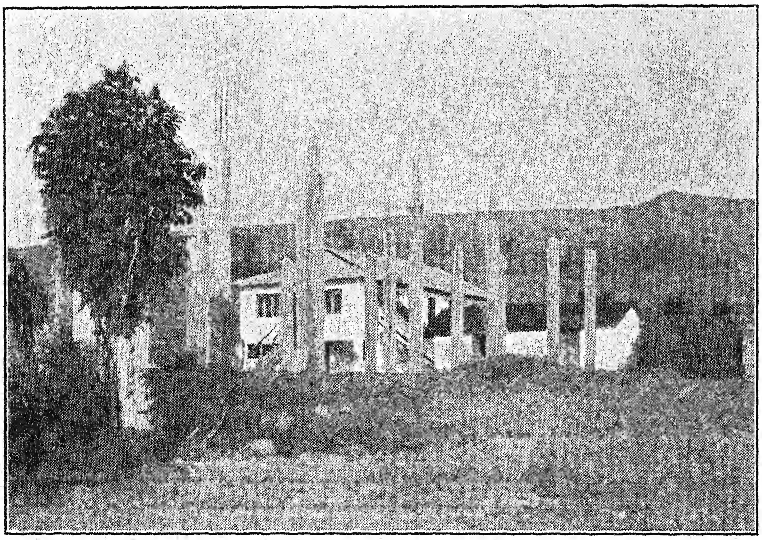


Fig. 34.—Compania Colonial Africana, Moka, Fernando Po.

with a letter of introduction to the General. About two miles from his house (Riasaka, 2000 feet up, Fig. 45) we found General Valdes waiting for his Chevrolet, and he was rather taken aback at this somewhat unprecedented invasion. However, he speedily recovered, and we were very soon at the house, where he made us very welcome and very comfortable. In the morning we were sent off early, after an excellent breakfast, to Moka, 2000 feet higher, where we found Señor Juan Bonelli Rubio, a naval engineer, and his charming wife, who took care of us until the appearance of Señor Joaquin Vidaror, of the Compania Colonial Africana (Fig. 34) to whom we had an introduction.

(To be continued.)

BEHIND THE SCENES IN THE MUSEUM. V.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

The second of the scientific Departments is that of Entomology, and it follows naturally enough upon the Zoological Department both in point of numbers and in history, although territorially it is not so extensive. The premises of this important Department include the greater part of the Basement floor of the west wing and the newly-erected western end of the New Spirit Building. Actually, although an area of some 35,000 square feet is thus set aside for entomological purposes, it is not sufficient for the rapidly increasing collections and the number of research workers, so that plans are now being made for a very necessary increase of accommodation.

In no Department is the disparity between the specimens exhibited to the public and the collections in store or study so great; for, despite the really enormous amount of material in the Department, the whole exhibited series is confined to part of one small gallery on the Ground floor of the west wing.

This does not mean that this great and private host of insects is unsuited for public inspection or devoid of interest. It means that, having arranged a perfectly adequate introductory series for the public, the Departmental Staff is wholly engaged on study and research, for which continual reference to its great collections is necessary. It is important to make this clear, for there are many who consider that specimens not on exhibition cannot be of interest, that they must be duplicates and as such should be distributed to less wealthy and humbler institutions.

The Entomological Department does make numerous exchanges with, and gifts to, many other institutions of recognized standing at home and abroad, and would gladly make more. But it should be realized that it is scientific necessity and natural profusion, not professional jealousy or excessive acquisitive zeal, that make the Insect Collection so large. To use a homely simile, because most of us prefer to wear only one suit of clothes at a time, must the remainder of our wardrobe be considered duplicate, unnecessary, and rightly to be given away?

The actual number of specimens in the Department cannot at the moment be stated precisely. The last census was in 1931, on the occasion of the Museum's Jubilee, when a detailed analysis of the collection was published.* In May of that year

* *Entomologist*, 1931, vol. 64, p. 242.

the total number of insects in the Museum was 7,834,933, of which about five million were in the arranged collection and the remainder was still undergoing examination. It may be of interest to state that of the total nearly one-half consisted of Coleoptera or beetles, and that, huge as the whole figure is, the Museum has only representatives of little more than half the known species. Since the date on which these figures were compiled there have, of course, been considerable additions, so that at the present time the total collection is estimated at something just over 8,500,000. The yearly total of these additions, by gift, exchange, and purchase, averages about 300,000.

Words should be unnecessary to emphasize the magnitude of the Department's task. To bring up to date the identification, arrangement, and indexing of the specimens always awaiting attention, with fresh consignments continually arriving, is a work that might well be called a labour of Hercules. The mere mechanical handling of the insects is a full-time occupation in itself, but when comparison, study, and scientific description are added, to say nothing of routine correspondence and attendance on visitors, the need for a considerable and qualified staff and well-equipped laboratories becomes evident to even the most prejudiced. Unfortunately, owing to the economic crisis the Treasury have hitherto been unable to allow the increase in the scientific staff that had been previously promised. The personnel of the Department numbers forty-three, and is under the control of the Keeper, Mr. N. D. Riley. There are two Deputy Keepers, and the scientific staff otherwise consists of nine Assistant Keepers and five unofficial workers on the scientific side. The technical staff numbers eight, while there are eight attendants, and a temporary staff of nine whose duties lie mainly in the direction of typing, indexing, labelling, and general preparatory work.

Entomology is, of course, the science of insects, and the Department is the only one in the Museum confined to such strict systematic limits; for as insects are animals it may be asked why the Zoological and Entomological Departments are under separate control. Until 1913 they were not so, and the Insect Collection formed merely a part of the zoological series. However, the rapid expansion which accompanied recognition of the fundamental importance of entomological work in connexion with many urgent economic problems led ultimately to the separation of the Departments, primarily on account of the difficulties of administration.

The economic importance of insects has long been realized and

the War brought to it, as to many other things, much greater recognition. But the Department, though it makes great contributions to economic problems, is essentially interested in systematic work, in the comparison of various forms, in the exact determination of genera and species, and in the description of specimens new to science. Without this carefully constructed groundwork no economic work would be secure and the whole fabric of zoological science would be nothing but a pretence.

The range of insects is great both in size and variety, in form and colour. Those who keep pleasant memories of sunny days are under a great debt to these forms of life. What sort of summer would it seem without the chirping of the grasshopper, the buzz of bees, or the erratic flight of the butterfly on the summer wind? The pollination of the flowers and the honey on the table are things to be thankful for and are the results of insect life. On the other hand, the sting of the wasp, the ravages of the clothes moth, and the unpleasant activities of the bed-bug are insect maladies to be deplored. Abroad and in warmer lands insects again may cause two extremes; for the amazing beauty of some tropical form winging its way through the sunlit glades is in wide contrast to the delirious and fevered victim of a mosquito bite.

All these multifarious agents for good or ill are the care of the Entomological Staff, to whom on nearly every day of every year specimens from all parts of the world arrive. The identification of these and the preparation of reports upon them take up a very considerable amount of time, and in this connexion it is important to mention the excellent cooperation which exists between the Department and very many institutions all over the world for the exchange and description of material.

The Imperial Institute of Entomology, an independent body set up expressly to assist Colonial governments, is concerned with economic entomology. It has its headquarters in the Entomological Department, and the close association is one of much mutual benefit. The highly important work of the Institute depends greatly on the identifications made by the Museum Departmental Staff, while to the Museum the Institute presents a considerable number of specimens. In 1932 the number of specimens thus transferred was over 16,000, of which nearly 400 were types of new species.

It is easy to write that a department's work is of great importance, but it may be hard to show that it is so. The Entomological Department has, however, an unusual testimony to its worth in the shape of the recent addition to the New Spirit

Building. This was built entirely through funds provided by the Empire Marketing Board, in order to further the systematic study of insects, which they recognized to be the Department's prime function and, moreover, of fundamental importance to the many workers in all parts of the world, whose chief concern is the study of entomology in relation to agriculture, medicine, etc. While there is thus a very large amount of work always coming to the Department by post, there are also numerous personal interviews and telephonic communications, and nearly 5000 persons come

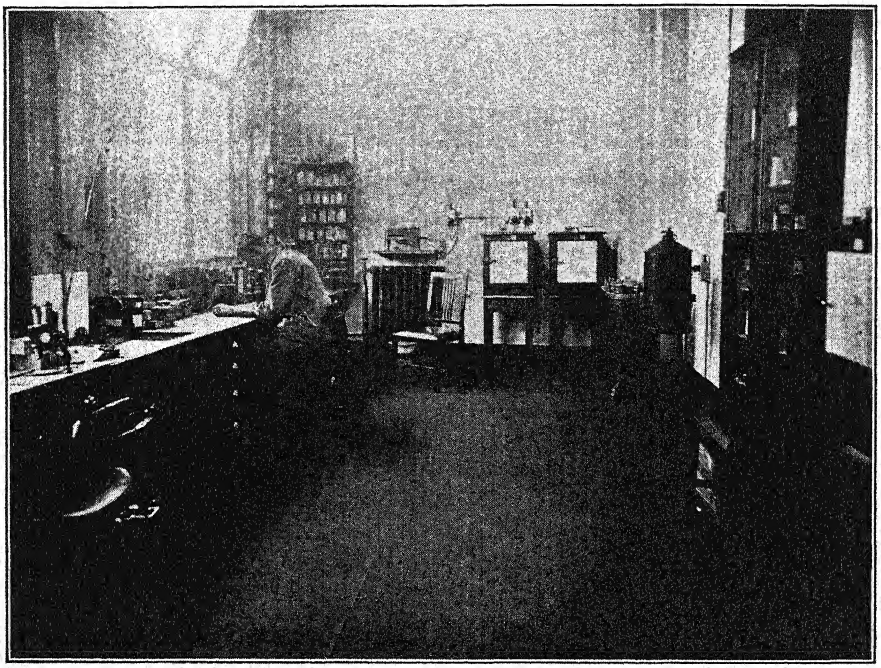


Fig. 1.—One of the Studies in the New Spirit Building.

into the Departmental offices as students or other inquirers during the year.

Each member of the Staff has his allotted task and insect group, and to him are referred the particular specimens, letters, or visitors requiring attention. The routine office work is thus considerable, but in addition each must constantly be bringing his part of the collection up to date, examining, identifying, preserving, storing, placing on exhibition, or describing the material which comes to the Museum collections.

Much of this work is done in one of the larger rooms, where also students are accommodated (Fig. 2), but the member of the

Staff does his detailed work in his own study (Fig. 1). The method of examining and identifying the specimens varies according to the particular Order to which they belong. Some kinds are large and can be examined and identified accurately by the naked eye; others require dissection and examination under a microscope. Whatever method is used, it will be obvious that access to a very large named series and a good library is essential.

When a collection of specimens comes to the Museum, its arrival is noted and the particulars recorded, and it is unpacked

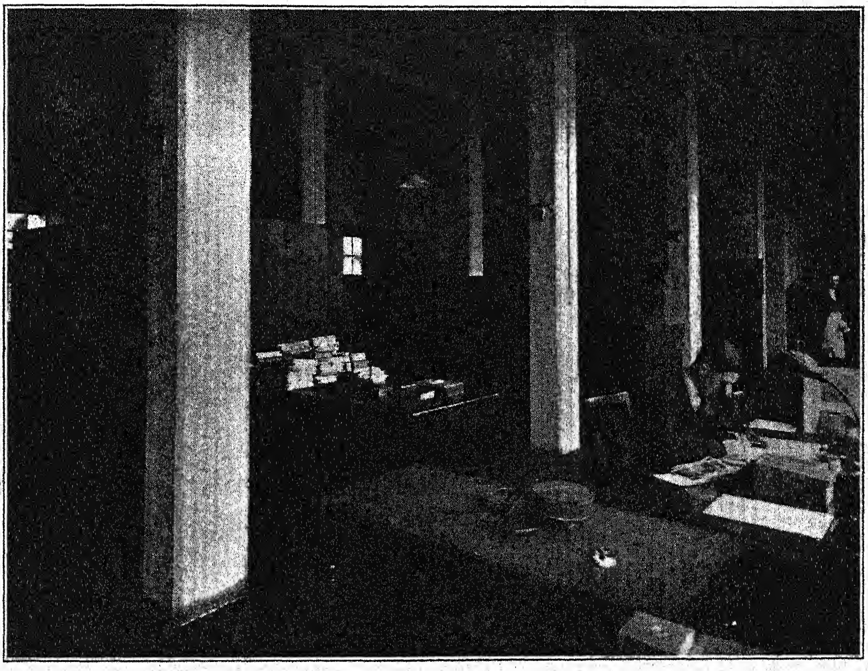


Fig. 2.—Store- and Work-room in the New Spirit Building.
The brackets on the pillars are intended to carry the mezzanine floor required when ultimately the building is used for collections in spirit.

so far as is possible without doing damage to the insects. The boxes are sent to the Setting Room to await attention (Fig. 3). In fact, the Setting Room comprises four largish rooms and accommodates six persons, who are exclusively employed on this highly important, if somewhat monotonous task. The duty of this Staff is to prepare and mount the butterflies, moths, beetles and other insects, so that they can be permanently stored in a manner which permits of ready examination.

First of all, the insect is "relaxed" by placing it, in its

original paper container (which bears the full history of the specimen), in a zinc box the interior of which is kept moist by means of a piece of damp flannel. After twenty-four hours in this situation the specimen is removed and, if susceptible to such treatment, fitted to a setting-board. This is really two strips of wood, mounted on a third, with a space between them. The insect is pinned through the thorax and then its body is placed in the space and is adjusted so that when its wings are spread out laterally they lie naturally upon the lateral strips of wood. The

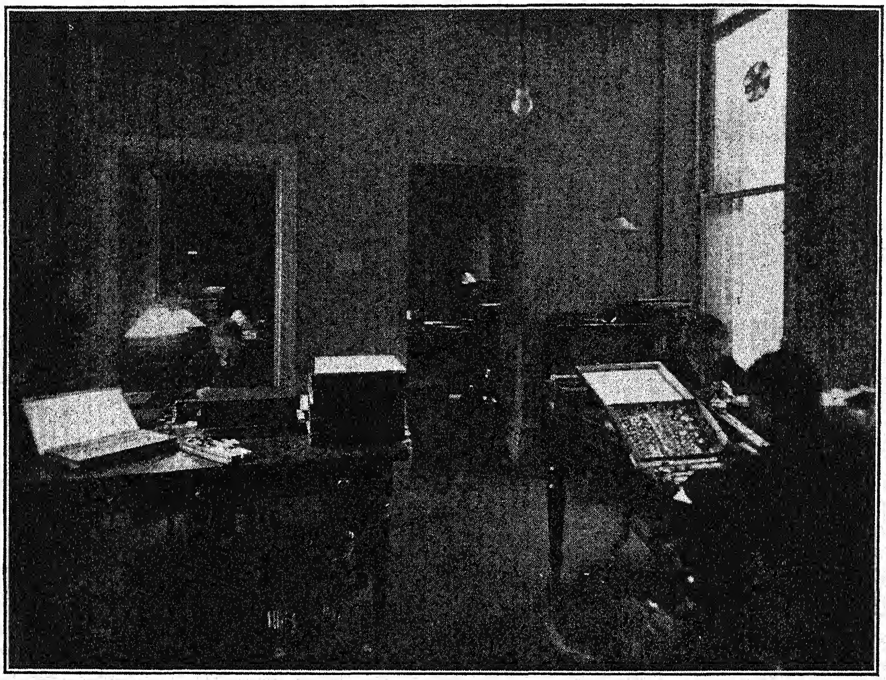


Fig. 3.—One of the Insect Setting Rooms.

wings are extended and pressed between the strips of wood and superimposed pieces of tracing paper held in position by pins. The connexions between the wing and the body are sometimes cut to some extent to facilitate setting and to obviate "springing" of the wings after the specimen is removed from the setting-board. When the specimens have been left in this condition for about a fortnight they are removed from the boards and pinned into oblong, flat store-boxes, lined with white paper and floored with cork or peat, there to await examination by the specialist concerned prior to incorporation in the cabinets which house the

permanent general collection of the Department. Every specimen can always by fully examined by lifting it out with a pair of tweezers grasping the pin head. Many kinds of insects, such as beetles, bugs, or grasshoppers are not set, but only pinned. Very small specimens cannot be pinned at all and are generally stuck on to pieces of card. Others, again, cannot be dealt with until mounted for microscopical examination.

Immediately the specimens have been mounted, and before they are sorted, each is provided with neatly printed little labels

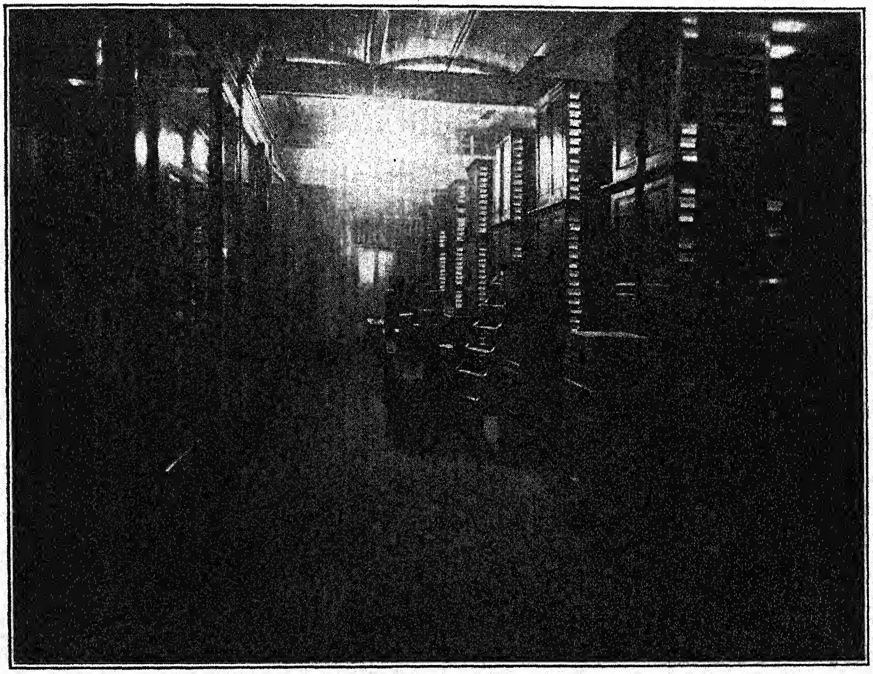


Fig. 4.—Store-room containing the Oberthür Collection of Lepidoptera.

giving its whole history. This printing work is also done in the Setting Room on a small hand-press. The average number of insects dealt with annually by each person in the Setting Rooms is almost exactly 10,000. The work calls for much skill and patience, and this annual average reflects high competence on the part of the Staff; but it is easy to see that at its present staffing it cannot hope to deal with the annual additions to the collections. Increase of staff, no less than increase of accommodation, is urgently required. The boxes containing specimens are kept either in the room of the appropriate scientific expert

or are stored. One of the stores (Fig. 4), is a long corridor literally packed with such boxes and containing in all about a million specimens. Most of these are butterflies, and hence this particular store is popularly known to the Works Staff as "Butterfly Alley." Great as is the number of mounted specimens, each is readily accessible owing to the excellent systems of card-indexing.

For the scientific study of these dead specimens the microscope, the dissecting dish, and the scientific treatise are not the

FIG. 5.—INSECTORIES, ON THE ROOF OF THE NEW SPIRIT BUILDING.

only things employed. In the New Spirit Building extension there are thoroughly up-to-date appliances such as electric ovens, electric refrigerators, cameras for microphotography, etc. Work is also carried on with the living forms and an experimental laboratory with all modern requirements, such as thermostatic controls, has been built and equipped on the roof of the building (Fig. 5). Here can be studied many phases of the life of insects, particularly those of economic importance. This work is of great value, and, quite apart from the strong connexion between the Museum and the Imperial Institute of Entomology already

referred to, many manufacturing concerns, local authorities, and other museums and research institutions look to the Museum for help and guidance in times of entomological trouble.

One field of this sort of work may be specially mentioned, namely, the locust problem. Plagues of locusts are known not only from biblical records, but also from serious and not uncommon occurrences in many parts of the world to-day. For many years research of some sort or another has been done on

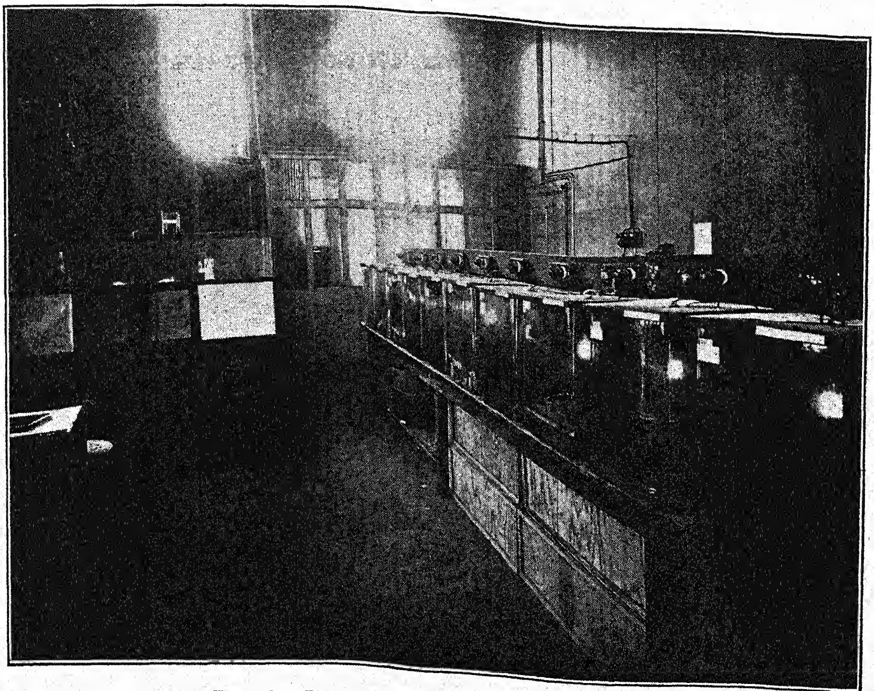


FIG. 6.—LOCUST BREEDING IN WEST TOWER.
The glass containers in which the locusts are bred stand on the table (right); they are electrically heated.

the problem, but one of the most important centres of modern work is the Museum. It may be news to many visitors that in a room in the West tower there are many living locusts kept for breeding and research purposes (Fig. 6). So important is this part of the Museum's work regarded abroad that no fewer than forty-eight countries send bulletins of information to, or apply for information from, the Museum authority, through the Locust Committee of the Economic Advisory Council.

All this research work could not, of course, be accomplished without the help of a good reference library, and the number of

purely entomological works available for reference in the Department is close on 40,000, for the organization and care of which the present Zoological Library is still largely responsible.

Members of the Department do not, however, rely merely upon information and specimens submitted to them by others; for, from time to time, expeditions are arranged and led by members themselves. Within recent years excellent results have been obtained from expeditions to the South American Andes, the Carpathians, and the islands of the Gulf of Guinea, while Departmental collecting parties have made several fruitful trips to the Scottish Highlands.

For the public numerous guides and advisory pamphlets are published on the treatment of a wide range of pests: for the scientist the number of specialist papers written by the Staff is impressive.

Enough has been said to show that an entomological department is no mere society of "bug-hunters," but a highly organized centre of research of world-wide importance. The Panama Canal was made possible, Buenos Aires was able to be built, and great tracts of land throughout the world have been rendered habitable through the work of entomologists, and in all such work this Department of the British Museum has played its part and gained a reputation that is world-wide.

TWO RARE SOUTH AMERICAN MONKEYS.

By Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

The Museum has recently received as a donation from the Rowland Ward Trustees two mounted specimens of rare South American monkeys, a white-collared titi (*Callicebus torquatus*) (Fig. 1) and a black-headed uakari (*Cacajao melanocephalus*) (Fig. 2), both of which have been mounted in the Rowland Ward Studios. They will make interesting additions to the Exhibition Galleries.

The titi monkeys, of the genus *Callicebus*, would really appear to represent at least three genera: one to include *Callicebus torquatus*, which is entirely different in markings, pattern and texture of coat from the other members of the genus; one to include the *Callicebus gigot* group; and the third to embrace *Callicebus cupreus* and its allies. There would

appear to be some support for such a classification to be found in the skulls of the titi monkeys and it may be necessary at some future time to divide the genus into the three generic groups here indicated. At the moment, however, the available cranial material of the *torquatus* group is not sufficient to justify such a division.

FIG. 1.—WHITE-COLLARED TITI.

FIG. 2.—BLACK-HEADED UAKARI.

The addition of a mounted black-headed uakari to the exhibition series is one of some importance, since the Museum received from the same donors some little time ago mounted specimens of the two other species of this rare genus, that is, the red uakari (*Cacajao rubicundus*) and the bald uakari (*Cacajao calvus*), so that now all three species are represented by up-to-date specimens.

BOOK NOTICES.

The British Fur Trade Year Book, 1933. Pp. xxiv + 472. (London: Hutchinson & Co. 10*s.* 6*d.*)

ONE of the most valuable features of this present volume is a list of names of the different furs given in seven languages, entitled "A Dictionary of Furs." In addition to the English and scientific, or Latin, name, we find the titles, given in French, German, Russian, Spanish, and Italian, of 159 different furs.

The volume commences with a short history of the British Fur Trade by Mr. F. Rexford Poland, based on the work of his father, the late Mr. Ernest Poland. Then follows a diary of events concerning the fur trade, where entry is made of all the more important fur sales and auctions, together with such religious holidays on which no business may be conducted.

The second section deals with Government regulations affecting the fur trade and the third section with the Constitution and Composition of the British Fur Trade, in which some useful information is given on silver fox farming, and the personnel of the London Fur Exchange and the London Fur Trade Association is given in detail. Diagrams of the various trade-marks are reproduced as an appendix to the dictionary; these are sometimes zoological in design, but on the whole the fur-bearing animals are but poorly represented in these designs.

Section V deals with the fur trade of the Empire, with special reference to Canada, by the Hon. G. Howard Ferguson, High Commissioner for Canada, followed by sections dealing with the scientific educational side of the fur trade, a directory of the principal furriers, and an appendix of exports and imports.

This volume will be of considerable use not only to those intimately connected with the fur trade, but also to the scientific worker. GUY DOLLMAN.

Functional Affinities of Man, Monkeys and Apes. By S. ZUCKERMAN. Pp. xviii + 203, with 24 figures on 12 plates. (London: Kegan Paul, Trench, Trübner & Co., Ltd. 1933. 10*s.* 6*d.*)

THIS work follows closely on the heels of "The Social Life of Monkeys and Apes," by the same author, and is quite as interesting and full of information as the earlier volume. After a foreword there are two chapters dealing with the classification of the Primates; generally speaking, the classification adopted is that of Pocock and Schwarz, but the Colobidæ of Pocock have been degraded to sub-family rank, although the name is still written Colobidæ instead of Colobinæ. This does not add to the natural arrangement of the Order and in the reviewer's opinion is a mistake. The knotty problem concerning *Callimico* is left strictly alone, and the author seems undecided whether to use *Pithecus* or *Presbytis* for the Langurs. The genus *Miopithecus* appears again owing to the occurrence of a sexual skin in the Talapoin monkey, which is not found in the Guenons; this seems a very justifiable reason for again using the term *Miopithecus*.

It is difficult to agree with the suggestion that *Pithecus cruciger* is a hybrid between *Pithecus rubicundus* and *Pithecus chrysomelas*; there would seem to be no reason for such an idea, as these three species are as distinct and different from one another as any species could be.

The chapter dealing with the ages of apes and monkeys is very interesting; one learns with astonishment that the following maximum records are known:—mandrill 46 years; baboon 45 years; macaque 29 years; chimpanzee 26 years; orang 26 years; lemur 26 years; capuchin 25 years; guenon 24 years; and

gibbon 24 years. Then follow some remarks on the periods of gestation of apes and monkeys; one learns that the period is 150 days in the Hapalidæ, 150 to 180 days in macaques and baboons and as much as 275 days in the orang, that is, nearly equal to the period in man (280 days).

Chapters on Blood Reaction and general behaviour follow; in the latter the difference in the method of drinking employed by lemurs and monkeys is described, also the difference in facial expression and their methods of grooming themselves. Differences in nursing are gone into in some detail, and towards the end of the book there is a chapter dealing with "Disease and Parasites of the Primates." It is, perhaps, astonishing to read that monkeys and apes in captivity rarely suffer from vermin. The Kivu gorilla, it is stated, shares with man the privilege of acting as host to a very obnoxious louse, while malarial-like parasites have been found in both New and Old World monkeys.

The volume concludes with an extensive bibliography, which will be of considerable use to the student and worker on this fascinating subject.

GUY DOLLMAN.

"*All the Other Children, a book of Young Creatures.*" By C. FOX SMITH. Pp. x + 101, with 51 plates. (London: Methuen & Co., Ltd. 1933. 7*s.* 6*d.*)

THIS little volume will appeal to grown-ups as well as to children; especially to those artistically inclined. The illustrations are of the best and the text, although light, is correct as regards most of the details and is written in an entertaining manner.

The photographs of the young fox and baby tapir are excellent illustrations, and the one entitled "Creepy-crawly," depicting an alligator and its young, might cause even a grown-up to indulge in a bad dream. There are a large number of other photographs that hold the attention and excite admiration; among these may be mentioned the following:—"The Badger," "The Ostrich," "The Swan," "The Dormouse," "The Tortoise," "The Bloodhound," "The Elephant," "The Perch," "The Zebra," "The Raccoon," "The Lemur," "The Hippopotamus," "The Hedgehog," "The Owl," "The Giraffe," and "The Snake." All these are fine studies of young animal life and should be of very considerable service to the student of art and zoology.

It is a little surprising to find in a book of such excellence an illustration (facing p. 48) of a Mangabey monkey nursing a small monkey entitled "Mangabey and Meercat"; the term "Meercat" in English should be reserved for those mungoose-like carnivores of the genera *Cynictis* and *Suricata.*

This book is to be recommended to all those interested in the childhood of animals, whether they are zoologists, artists, or the man-in-the-street and his children.

GUY DOLLMAN.

The Whipsnade Animal Book for Children and Others. By HELEN M. SIDEBOTHAM. Pp. 205, with 52 illustrations by JOHN R. SKEAPING. (London: Victor Gollancz, Ltd. 1933. 6*s.*)

THIS volume will be useful to the young visitor to Whipsnade, as it gives a general account of the grounds and chapters on the elephants, bird sanctuaries, aviaries, bears, deer, kangaroos, cattle and the native inhabitants of the Park. There is much that is helpful to children in the text, and it can be said to be instructive. More care as regards some of the details would, however, have added to the value of this work; it comes as a shock, for instance, to read that the American Black Bear is "believed to be merely a variety of the Old World brown bear," when in fact, the two species are so distinct that they are now considered to belong to different genera. Further, it would be interesting to

learn from the author where her information comes from regarding the race of pigmy elephants "not much bigger than ponies." The smallest elephant at present known, with any certainty, is the West African forest-elephant (*Elephas africanus cyclotis*), an animal which, it is true, is smaller than the great bush-elephant of Africa, but would, nevertheless, be rather an out-size where ponies are concerned.

The illustrations, although not outstanding, will doubtless serve their purpose; they are outline sketches which should tempt the young artist to use the Christmas box of paints.

GUY DOLLMAN.

The Dissection of the Rabbit. By R. H. WHITEHOUSE and A. J. GROVE. Pp. viii + 195, with frontispiece plate and 78 figures. (London: University Tutorial Press. 1933. 3*s.*)

THIS small volume is published as a companion to "The Dissection of the Frog," and in spite of the number of textbooks available on the anatomy of the rabbit, there would seem to be room for this carefully planned and well-illustrated work.

The photographic illustrations of the viscera and muscular systems are excellent and it seems a pity that the method has not been employed more extensively. A good photograph of a dissection of the nervous system would have been most stimulating to the novice, when trying his or her hand at this difficult task. At the same time, the wealth of diagrams will undoubtedly be of the greatest help to the student. The advantage which such outline sketches have over the old-fashioned complicated figures is very evident; in the old textbooks it took quite a long time to trace the very thin line from the figure of the dissection to the lettering at the side, and then one had to look up the letter in the text of the figure and find out what it referred to.

This book may be recommended to all who are faced with the probable dissection of the rabbit as a question in a practical examination in zoology.

GUY DOLLMAN.

The Geology of British Somaliland. By W. A. MACFADYEN. Part I of the Geology and Palæontology of British Somaliland. Pp. 87, with 15 figures on 4 plates and 1 map in pocket of cover. (Published by the Government of the Somaliland Protectorate, 1933. London: Crown Agents for the Colonies. 12*s.* 6*d.*)

THE geology of British Somaliland might appear to have received its full share of attention during the past few years, since a previous official report on the subject by Mr. R. A. Farquharson, Government Geologist, appeared in 1924, and two monographs on the geology and fossils of the Protectorate, based on collections made by Anglo-Persian Oil Company geologists, were published in 1925 and 1929 by the Hunterian Museum, Glasgow University; the geology of the north-eastern frontier region, moreover, was described by Mr. C. Barrington Brown in 1931. Nevertheless, the report now under review contains a large amount of new information as well as incorporating the work of previous authors. It is uniform with the two official reports on Zanzibar geology and palæontology published in 1927 and 1928.

The author, Dr. W. A. Macfadyen, was in charge of an expedition sent out by the Somaliland Petroleum Company, Ltd., from 1928 to 1930, when about three-quarters of the Protectorate (itself one-seventh larger again than England and Wales) was mapped geologically and large collections of fossils and rocks were obtained. The Eocene is the most widespread formation, covering most of the eastern half of the territory, but Archæan rocks, Nubian Sandstone, and late Tertiary volcanic rocks are well developed in the western half; the Jurassic

is less widespread, but rich in fossils. The detailed strata sections, measured at a number of localities, are a special feature of this report and will enable an exact record to be made of the horizons of the fossils collected when these come to be described. There is an appendix on water-supplies, but no reference to mineral resources. The coloured geological map, on the scale of 1 : 1,000,000, is very clear.

It must create a precedent for the results of a commercially organized expedition to appear as a Government report, and commendation is due on the one hand to the Company concerned for permitting this use to be made of the information obtained, and to the Colonial Office on the other hand for arranging for publication. It is understood that further volumes, dealing with the palæontology, will follow. L. R. Cox.

Jacko, the Broadcasting Kookaburra, his Life and Adventures. By Brooke Nicholls, decorated by Dorothy Wall. Pp. x + 106, with 66 illustrations in the text. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 4*s.* 6*d.*)

The author of this light and trifling book is well known in Australia as the naturalist of the Melbourne Broadcasting station. In it he gives a humorous account of the kookaburra bird, or laughing jackass, as we should call it, which he found as a fledgeling in a nest in a dead gum tree in the Gippsland mountains and later on introduced to the microphone. The bird's laughter appears to be familiar to listeners in to the Australian station, and it is for them that this book is intended. G. F. Herbert Smith.

The Brooks of Morning. Nature and Reflective Essays. By Donald Macdonald. Selected by his daughter, with a foreword by Edward S. Cunningham. Pp. xii + 245, with 1 plate. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 6*s.*)

The title of this little book is taken from that of the first of the forty-four articles which the filial devotion of Mrs. Whittle has brought together in memory of her father, Donald Macdonald, who served as a journalist on the staff of *Argus* for so long a time as fifty-one years, and was, indeed, at work up to within a half-hour of his death on November 23, 1932. All the articles originally appeared in the Melbourne *Argus*. They provide pleasant, if not deep reading, and reveal an intense appreciation of the beauty and charm of nature. The article "An English Hedgerow" will particularly please English readers; he clearly understood the secret which accounts for the unique appeal of the English rural scene. G. F. Herbert Smith.

Old Ashmolean Postcards. Oxford Science Series. Men of Science of the 18*th Century.* 6 Cards in monochrome. (Oxford University Press. 1933. 6*d.*)

This packet includes Nos. 54–59 of the series of postcards of the men of science of the 18th century, namely, James Bradley, John Wall, Gilbert White, Thomas Pennant, Edmund Cartwright, and James Sadler. The illustrations are well printed on card of good quality from half-tone blocks.

G. F. Herbert Smith.

Charles Darwin's Diary of the Voyage of H.M.S. "Beagle." Edited from the MS. by Nora Barlow. Pp. xxx + 451. Frontispiece, 2 text-figures, and 2 maps. (Cambridge: University Press, 1933. 21*s.*)

During the voyage of the "Beagle" Darwin kept a diary giving a day-to-day account of his occupations and impressions and of the incidents of the

voyage. This diary was written up as opportunity offered, sometimes almost at once, sometimes as much as three or four months after the events it recorded. It was based on the pencil jottings made in small pocket note-books carried by Darwin on his various journeys, and was intended to be read by his father and sisters, to whom it was sent in instalments during the five and a half years of the voyage.

This diary, which occupies eight hundred pages of manuscript, is published in full in the present volume, with an admirable preface and notes by Darwin's granddaughter, Mrs. Nora Barlow.

Curiously enough, one reviewer, misled by a hasty reading of the preface, has supposed that what the volume contains is a transcription of the eighteen "diminutive pocket-books," although it is quite clear from the extracts that are given from them that their rough notes and memoranda were simply the material on which the diary was based.

The diary was written solely for the reading of Darwin's home circle, and, at first at least, without any thought of publication, but it became, in its turn, the basis of the world-famous "Journal of Researches," first published as one of the volumes of the official report on the voyage and afterwards issued separately in two editions and several reprints and translations. Actually, not more than two-thirds of the matter contained in the diary was utilized, with much alteration and condensation, in the "Journal," while the latter was expanded by the inclusion of much detail and discussion drawn from the large separate note-books in which Darwin recorded his geological, ornithological, and other scientific observations. Further, in the "Journal," the strict chronological order is sometimes departed from, as, for instance, in the account of the Falkland Islands in Chap. ix, which combines observations made on two visits with an interval of a year between.

In two appendices to the present volume, references are given to the more significant passages of the diary that are omitted from the "Journal," and to those portions of the latter work that were added by Darwin on publication.

There can be no doubt that it was well worth while to publish the diary in its original form. It may perhaps be said that it adds little of scientific importance to what Darwin himself thought worthy of publication; but of its "human" interest there can be no doubt. If it does not throw much new light on Darwinism it throws a great deal on Darwin. As Mrs. Barlow remarks, "To many readers, Charles Darwin stands as a figure far advanced both in knowledge and in years; this volume contains a picture of him in the first freshness and eager enjoyment of life." To some perhaps the most enduring impression from reading these pages will be of the indomitable courage and endurance of the man, fighting all the time against the agonies of sea-sickness and facing extreme toil, hardship, and danger on his prolonged land-journeys. Not that he himself says much about these things; they have to be sought for between the lines. When, in Tierra del Fuego, the boats, hauled up on the beach, were in imminent danger of destruction, he writes: "One of the seamen just got hold of the boat as the curling breaker reached it; he was knocked over and over but not hurt." It is only from Capt. FitzRoy (quoted by Mrs. Barlow) that we learn: "There was scarcely time for the most active of our party to run and seize the boats before they were tossed along the beach like empty calabashes . . . had not Mr. Darwin and two or three of the men run to them instantly, they would have been swept away from us irrecoverably."

Much has been written about Darwin's sea-sickness and its effects on his health in after-life; one wonders whether there may not be some special significance, from the medical point of view, in a remark towards the end of the diary

which does not appear in the published "Journal," "suffering now more than I did three years ago." This was written in 1836, and "three years ago" takes us back, not, as we might have expected, to the beginning of the voyage, but to 1833, off the Horn, and "the worst gale he [Capt. FitzRoy] had ever been in."

At all events we do not find in these pages much trace of the valetudinarian shirker which some American psychologists have compared, to his disadvantage, with the gallant dare-devil Lamarck.

Mrs. Barlow raises a point of considerable importance with reference to the development of Darwin's views on evolution when she calls attention to the importance of Capt. FitzRoy's influence on him. FitzRoy was a devout and almost fanatical believer in the literal truth of the Bible, and they had long discussions on the subject. "Such discussions must have helped to form opinions, but it may well be that overt expression of them was delayed by Darwin's very real affection and admiration for Robert FitzRoy."

W. T. Calman.

MUSEUM NEWS.

The series of special lectures on Monday mornings at 11.30 is being continued as under. Most of them are to be illustrated by lantern slides and will be given in the Board Room, but the venue of some of them will be the Gallery concerned. The real need for a lecture room or theatre, adequate in size and equipment, has been well brought out by these lectures. The only accommodation at present available is the Board Room, the transformation of which to lecture purposes is awkward and hardly a success. Nevertheless, in default of an alternative it has to be used.

February.

5. †Mr. W. Campbell Smith: Rock-forming Minerals.
12. *Dr. W. T. Calman, F.R.S.: Lobsters and Crabs.
19. *Mr. H. W. Parker: Snakes.
26. †Mr. F. A. Bannister: The Colour and Shape of Crystals.

March.

5. *Mr. F. C. Fraser: Southern Whaling.
12. *Mr. J. Ramsbottom, O.B.E.: Dry Rot.
19. *Capt. Guy Dollman: The Animals recommended for Protection in Africa by the International Conference, 1933.
26. *Mr. A. W. Exell: Botanical Collecting in the Gulf of Guinea.

April.

2. Easter Monday. No special lecture. General Tours by the Guide Lecturer at 11, 12, 2.30, and 4.30.
9. *Mr. J. R. Norman: Our Food from the Sea.
16. *Mr. L. R. Cox: Fossilization.
23. *Dr. Susan Finnegan: Scorpions.
30. *Mr. G. Taylor: Plant Adaptations.

* * * * * * * *

The Museum was represented by Dr. C. Tate Regan, F.R.S., Dr. G. F. Herbert Smith, Capt. Guy Dollman, and Dr. Percy R. Lowe, O.B.E., on the panel of advisers to the United Kingdom delegation to the International Conference for the Protection of the Fauna and Flora of Africa, which was held

* Lecture in Board Room. † Lecture in Gallery.

in London from October 31 to November 8. The two last named were members of the technical sub-committee which drafted the annex of species to be protected, and Capt. Dollman was joint secretary of it. Many of the

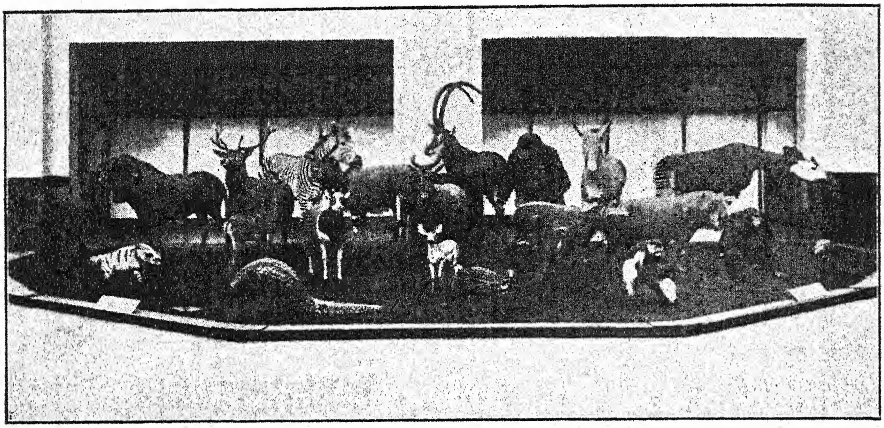


FIG. 1.—GROUP OF AFRICAN ANIMALS SCHEDULED FOR PROTECTION, ON VIEW AT THE RECEPTION, NOVEMBER 3, 1933.

delegates visited the Museum after the afternoon session on November 3, and were received in the New Whale Hall by the Earl of Crawford and Balcarres, K.T., on behalf of the Trustees. Among the exhibits arranged for them was a group (Fig. 1) of mounted specimens of some of the animals included in the annex.

* * * * * * * *

THE old iron building containing the exhibit of whales and dolphins was closed to the public on January 1, and will be pulled down as soon as the contents have been removed to the new Whale building.

Provision was made in the financial year 1895 for the erection of an iron building, measuring 120 feet by 45 feet, with a matchboard lining, as a Whale Room. It was opened to the public three years later, on Whit Monday, May 30, 1898, and has thus been open for nearly thirty-six years. Previously the whales had been shown, under what before the days of electric light must have been very gloomy and unsuitable conditions, in part of the west Basement. That accommodation, moreover, had been congested for many years and the specimens consequently were not shown to advantage. The story of congestion is repeated, the iron building having long been overcrowded; moreover, the building itself has with the passage of time tended to become dilapidated. The site will be used for a lofty block to accommodate the section of the Department of Entomology at present in the extension of the New Spirit Building as well as to provide some expansion for the Department of Zoology.

* * * * * * * *

A NEW exhibition to illustrate the taxonomy and biology of the ants has been arranged in the Insect Gallery.

* * * * * * * *

MR. J. E. DANDY, Assistant Keeper, Department of Botany, left England at the beginning of December to join the Oxford University Expedition to the south-west Sudan and the Congo Nile divide and will be away about five months.

ACQUISITIONS.

Department of Zoology.

Collections and photographs secured by Mr. F. C. Fraser, Assistant Keeper, while on a cruise with Col. E. T. Peel on the latter's yacht to the north of Scotland, Shetlands, and Faröe during July, the specimens including dolphins, and young birds and eggs.

An interesting collection of mammals, mostly large ungulates, shot in the Sudan by the donor during his recent expedition to north-east Africa; presented by Major P. H. G. Powell-Cotton.

Mounted specimens (a spider monkey from South America, a head of a female bighorn sheep from North America, a rare white-collared titi monkey from Brazil, and a black-headed uakari monkey from the Amazons); presented by the Rowland Ward Trustees.

A valuable collection of birds, consisting of about 813 skins, made by the donor in the Usambara Mountains, Tanganyika Territory; presented by Mr. R. E. Moreau.

Fine mounted head of an African elephant, shot in Uganda in 1907 by the late Major G. E. M. Norrie; presented by his son, Lieut.-Col. C. W. M. Norrie, D.S.O., M.C.

Mounted specimen of the Havana breed of rabbit; presented by Mr. G. V. A. Andrews.

A large collection of big game trophies from Africa and Asia, shot by the late Major P. K. Glazebrook; presented by Mrs. Armitstead.

A collection made by Mr. F. Shaw Mayer, consisting of 170 mammals, from New Guinea; purchased.

Skeleton of a fine sea-elephant from South Georgia; purchased.

Department of Entomology.

Dr. Oscar John's collection of thrips; purchased.

A collection of about 8500 insects, chiefly butterflies and moths, made in Malaya by the late Mr. A. R. Sanderson; purchased.

Department of Geology.

A slab, 8 feet high, containing a reconstructed group of palm leaves from the Tertiary beds of Italy; presented by Lord Rothschild, F.R.S.

A collection of British fossil vertebrates formed by the donor, including Eocene mammalian and bird remains from the Isle of Wight and Liassic reptiles from Dorsetshire and Yorkshire; presented by Mr. S. L. Wood.

Portion of a limb-bone of Grévy's zebra from the Middle Pleistocene of Olduvai, East Africa, collected in 1913 by the donor and found to be the other portion of a broken bone collected in 1931 by Dr. A. T. Hopwood, Assistant Keeper; presented by Prof. H. Reck.

Upper Jurassic ammonites collected by the donor from the Island of Skye; presented by Mr. M. MacGregor.

A new type of sessile bivalve from the Upper Lias of Oregon, U.S.A.; presented by Dr. E. L. Packard.

A series of plant fructifications from Triassic rocks of South Africa, recently described by Dr. H. Hamshaw Thomas; purchased.

Specimens of fungus-gnats and small flowers in amber from the Baltic; purchased.

Department of Mineralogy.

Large series of rocks and minerals collected by Mr. W. Campbell Smith, Deputy Keeper, in the United States and Canada, and selected by him from the

duplicates of the United States National Museum and the United States Geological Survey.

A valuable series of books on precious stones, including "De lapidibus pretiosis enchiridion" (1531) written in Latin verse by Marbode (1036–1123), Bishop of Rennes; presented by Mr. E. Heron-Allen, F.R.S.

A nice crystal of diamond, embedded in blue ground from the old open workings of the De Beers mine at Kimberley, which was given by Cecil Rhodes to the donor's father, George Hudson, then Treasurer-General of Griqualand West, on the occasion of the amalgamation of the De Beers Diamond Mines in 1888; presented by Mr. W. T. Hudson.

A series of minerals from newly-discovered occurrences, including large crystals of orthite and ægirine, corundum, nickel-bearing magnetite, gold in cellular quartz, and "cave pearls"; presented by the Director of the Geological Survey of Tanganyika Territory.

Crystallized sprays of native gold from the City Deep mine, Witwatersrand; presented by the Directors of the Central Mining Investment Corporation, Ltd.

Volcanic agglomerate from the crater of Lake Bosuntwi, Ashanti; presented by the Director of the Geological Survey of the Gold Coast.

Further specimens of transparent, pale yellowish silica-glass, the largest piece weighing 2279 grams (5 lb.), from the Libyan Desert; presented by the Director of the Survey of Egypt.

Tektites (billitonites) from Billiton, Dutch East Indies; presented by Engineer R. J. van Lier.

A large series of moldavites (tektites) from southern Bohemia and western Moravia; exchange.

New uranium minerals from the Radium Mines in the Belgian Congo; exchange.

A fragment from a new stony meteorite from West Siberia; exchanged.

A faceted, brownish-yellow danburite, weighing 2·246 grams (11·23 carats), from the Ruby Mines, Mogok, Upper Burma; purchased.

Chinese carving in fluorspar; purchased.

Department of Botany.

A collection of about 1000 different plants formed by Mr. A. H. C. Alston, Assistant Keeper, who, accompanied by Mr. N. Y. Sandwith, of the Royal Botanic Gardens, Kew, visited southern Albania in the summer of 1933.

Many interesting species of seaweed collected by Mr. G. Tandy, Assistant Keeper, while on a scientific visit to Dry Tortugas, Florida, in the summer of 1933.

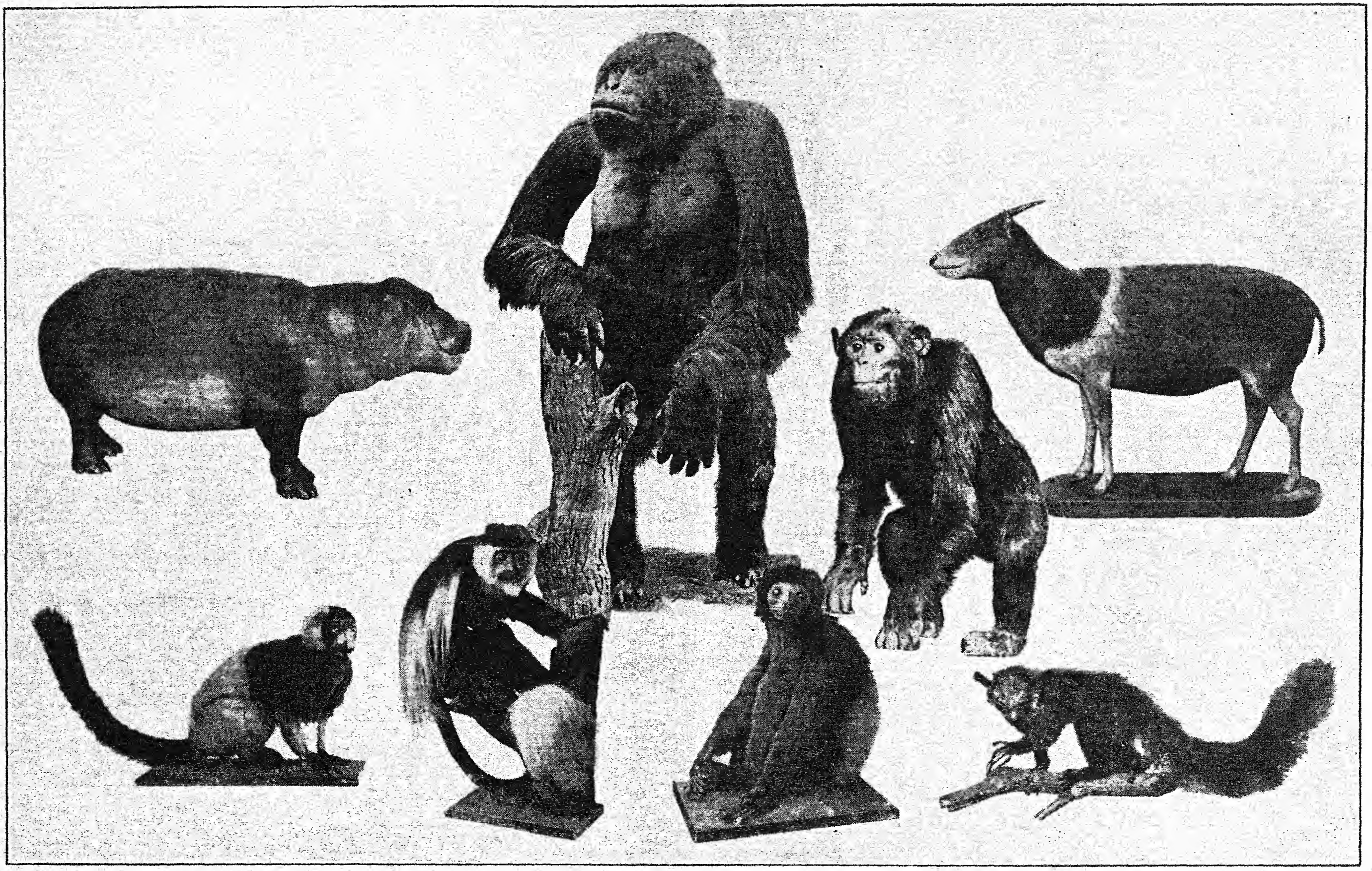
The herbarium of the donor's grandfather, Dr. Edward Ballard, F.R.S. (1820–1897), containing nearly 700 plants; presented by Mr. N. A. Macintosh.

About 1000 specimens of British brambles, collected by the donor; presented by Col. A. H. Wolley-Dod.

About 900 plants collected by Mr. T. G. Tutin, in the course of the Cambridge University expedition to British Guiana in 1933; presented through Dr. G. C. Carter, leader of the expedition.

The herbarium of Philip Sewell (1865–1928), containing about 3000 sheets of British plants chiefly from the Cleveland district of Yorkshire; presented by Mrs. H. G. Sewell.

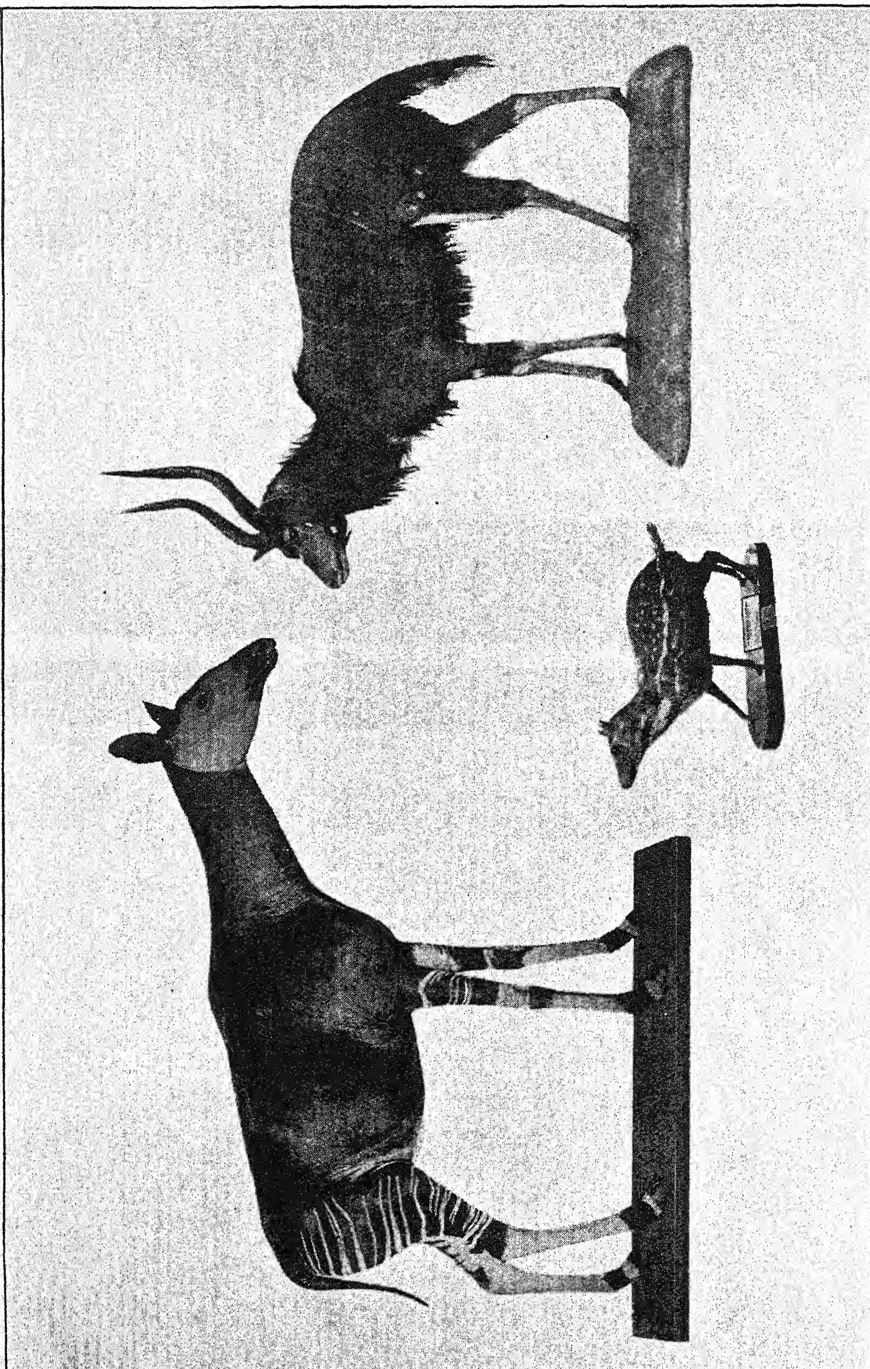
The important herbarium, containing about 40,000 sheets, formed by the testator; bequeathed by the late Mr. C. C. Lacaita.



AFRICAN ANIMALS REQUIRING PROTECTION.

Pigmy Hippopotamus, *Chœropsis liberiensis.*
Gorilla, *Gorilla gorilla.*
Chimpanzee, *Anthropopithecus troglodytes.*
Jentink's Duiker, *Cephalophus jentinki.*
Madagascar Lemur, Lemuridæ.
Colobus Monkey, *Colobus.*
Madagascar Lemur, Indrisidæ.
Madagascar Lemur, Chiromyidæ.

It should be noted that the illustrations differ in scale.



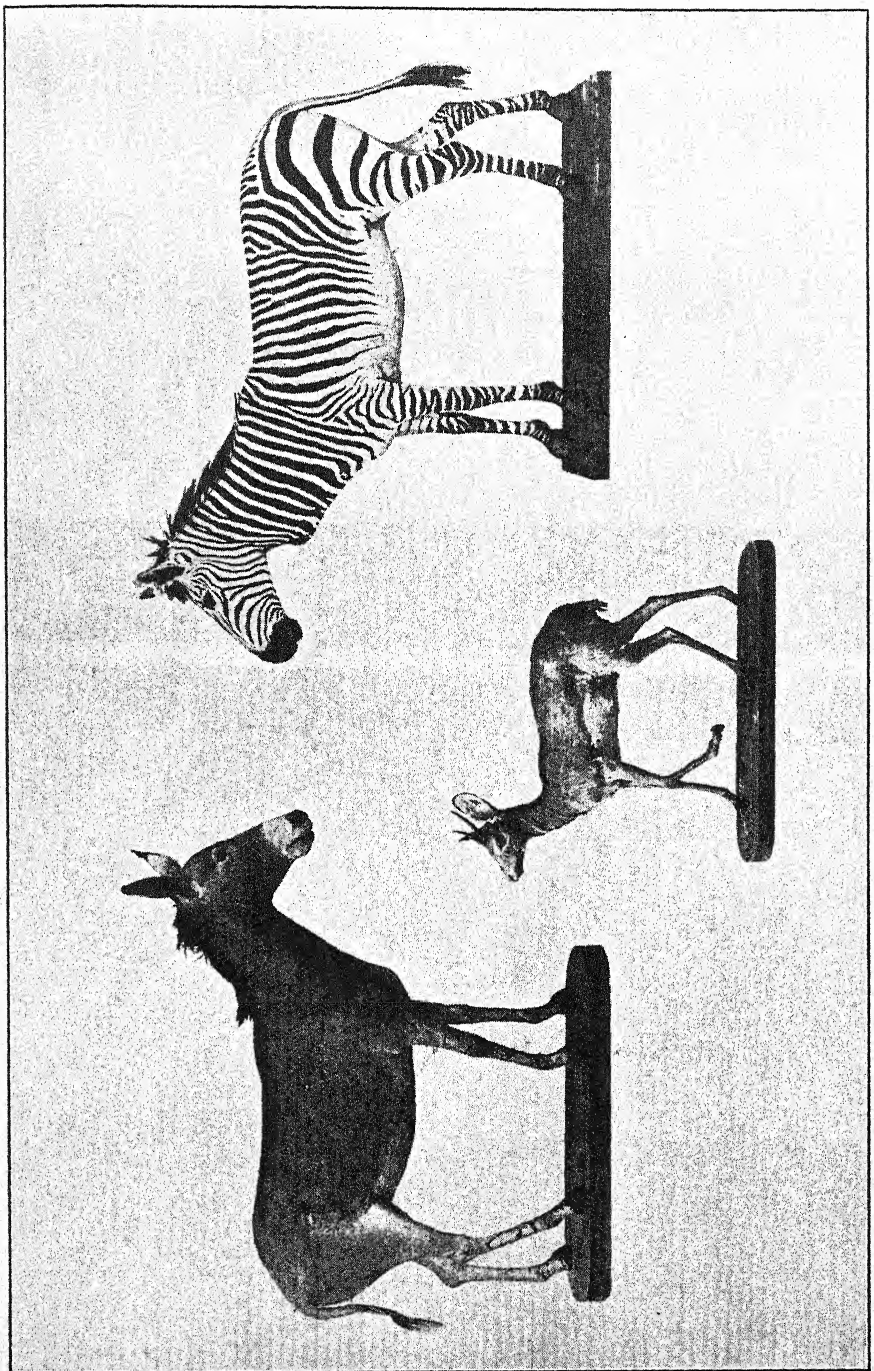
Okapi,
Okapia johnstoni.

AFRICAN ANIMALS REQUIRING PROTECTION.

Water Chevrotain,
Hyemoschus aquaticus.

Nyala,
Tragelaphus angasi.

It should be noted that the illustrations differ in scale.



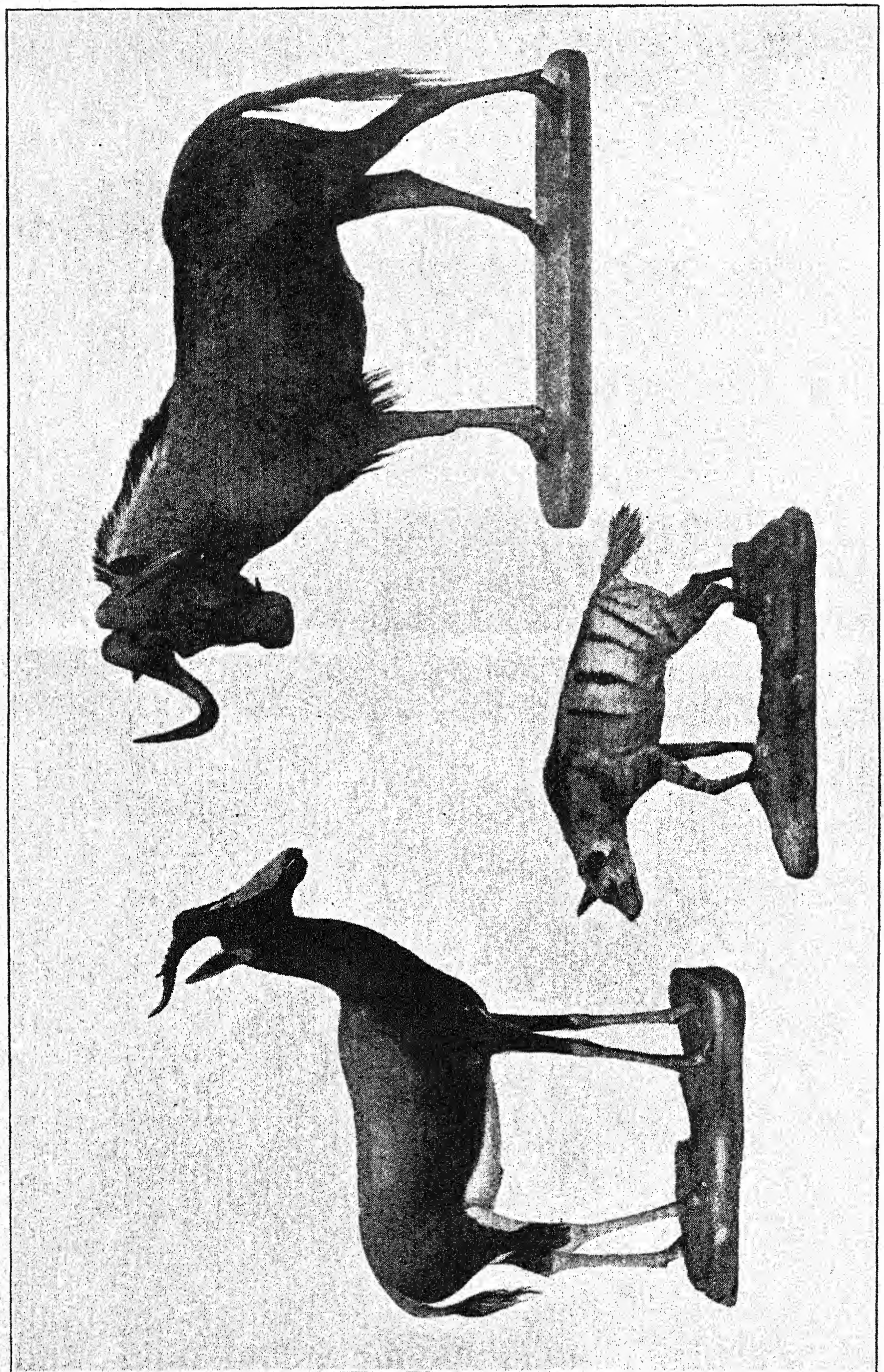
Wild Ass,
Asinus asinus.

AFRICAN ANIMALS REQUIRING PROTECTION.

Beira,
Dorcatragus megalotis.

Mountain Zebra,
Hippotigris zebra.

It should be noted that the illustrations differ in scale.



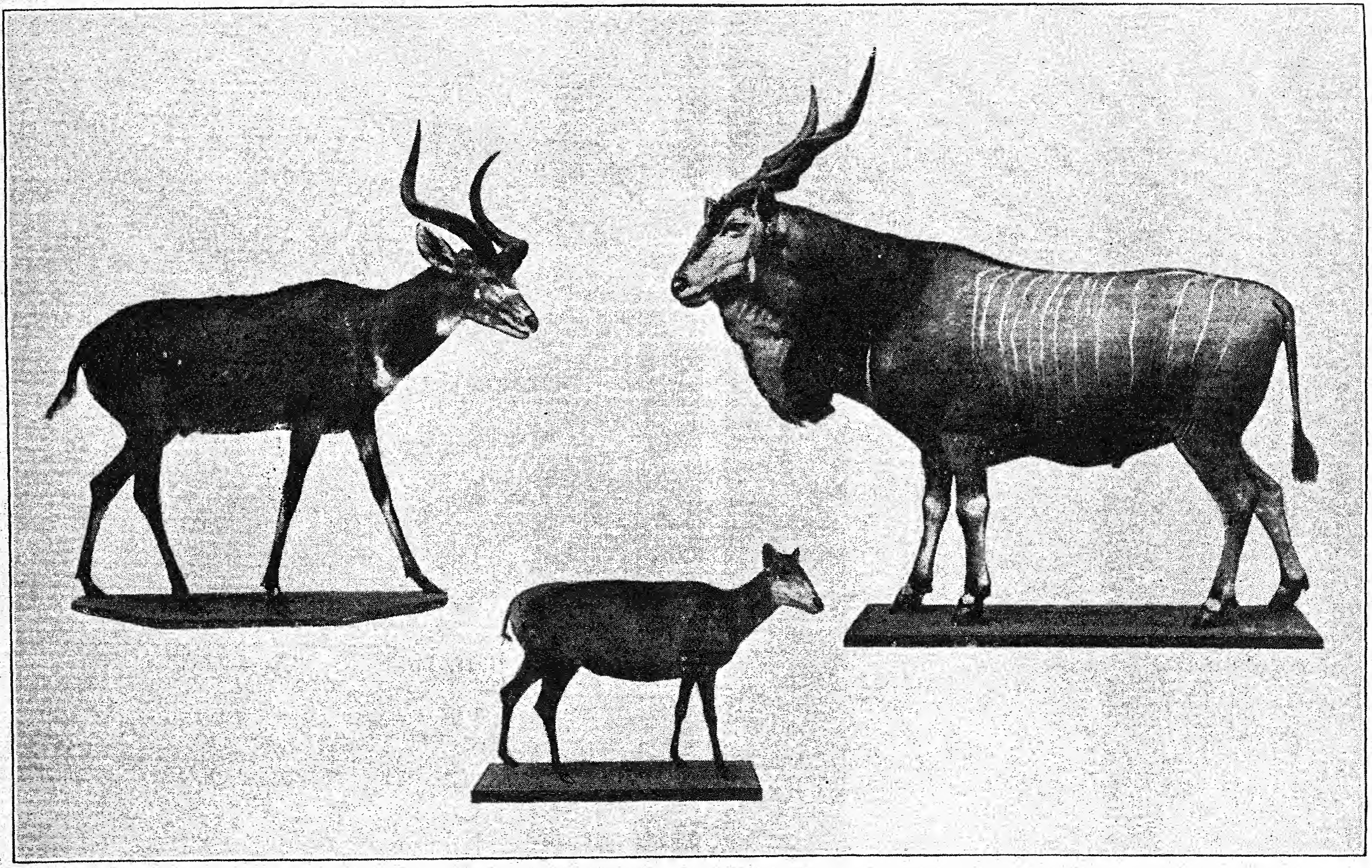
AFRICAN ANIMALS REQUIRING PROTECTION.

Bontebock,
Damaliscus pygargus.

Aard Wolf,
Proteles cristatus.

White-tailed Gnu,
Connochætes gnou.

It should be noted that the illustrations differ in scale.



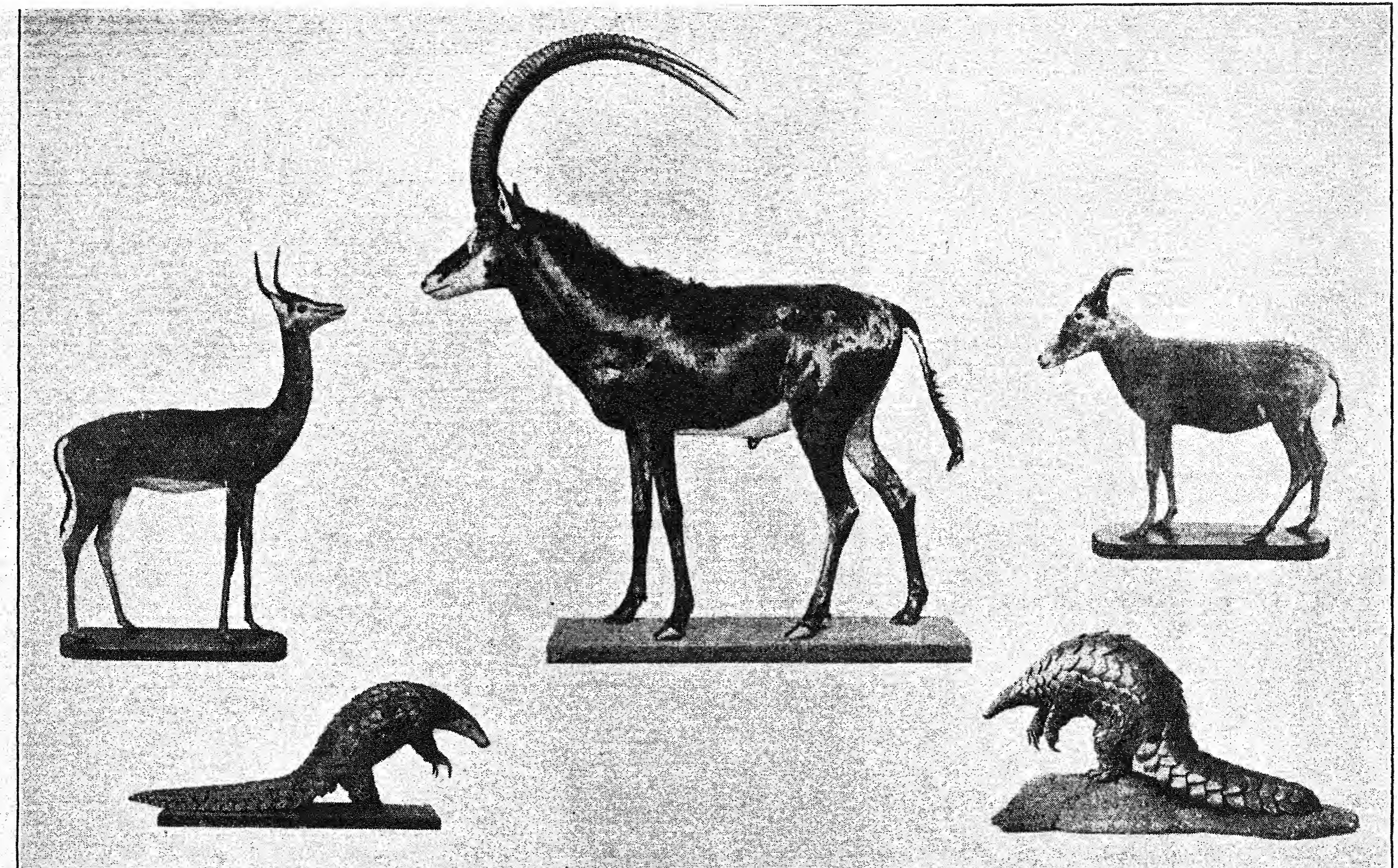
AFRICAN ANIMALS REQUIRING PROTECTION.

Mountain Nyala or Buxton's Bushbuck, *Tragelaphus buxtoni.*

Yellow-backed Duiker, *Cephalophus sylvicultrix.*

Giant Eland or Lord Derby's Eland, *Taurotragus derbianus.*

It should be noted that the illustrations differ in scale.



African Animals requiring Protection.

Dibatag or Clarke's Gazelle, *Ammodorcas clarkei.*

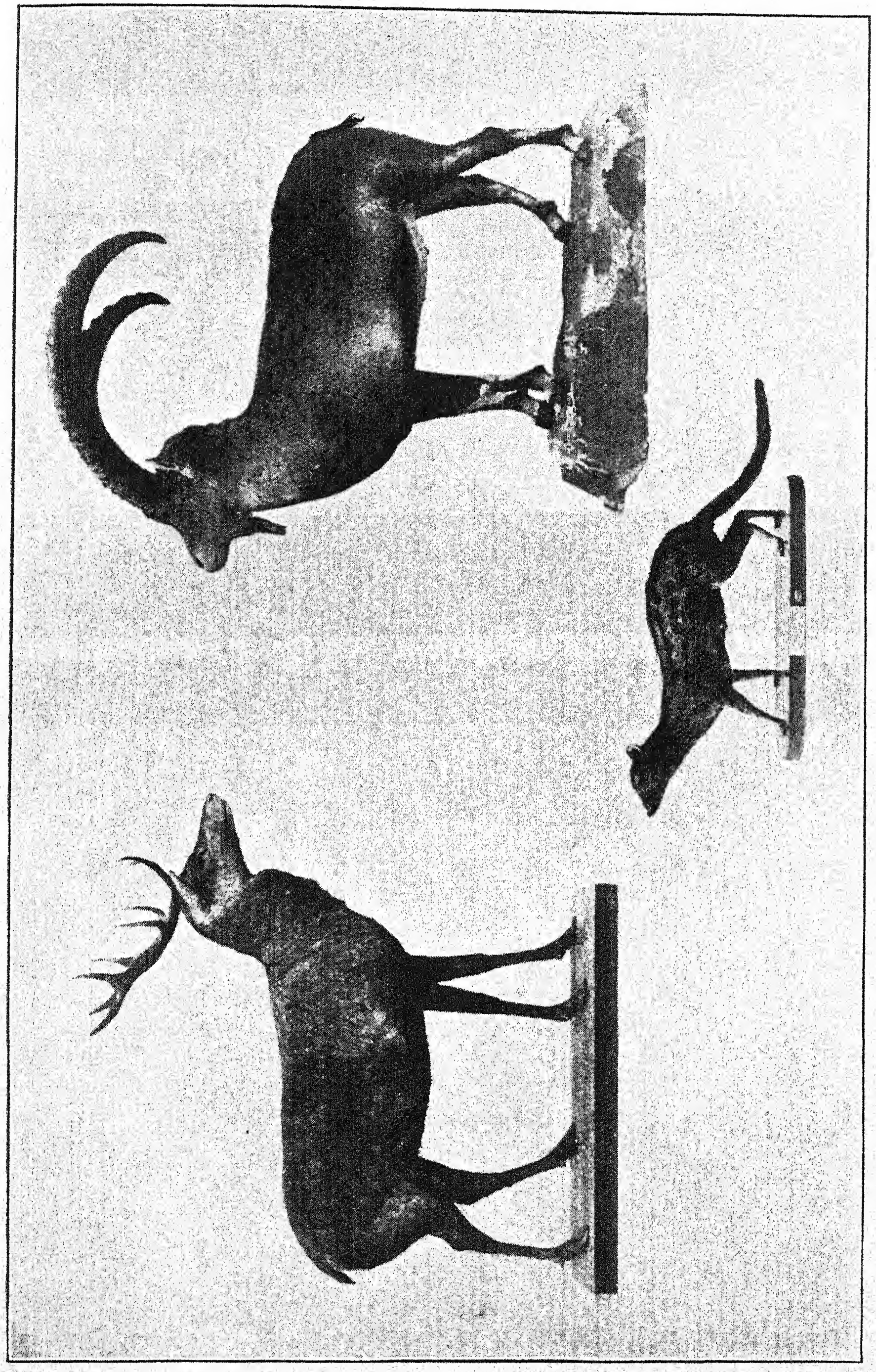
Giant Pangolin, *Manis gigantea.*

Giant Sable Antelope, *Hippotragus niger variani.*

Northern Hartebeest or Bubal, *Bubalis buselaphus.*

South African Pangolin, *Manis temminckii.*

It should be noted that the illustrations differ in scale.



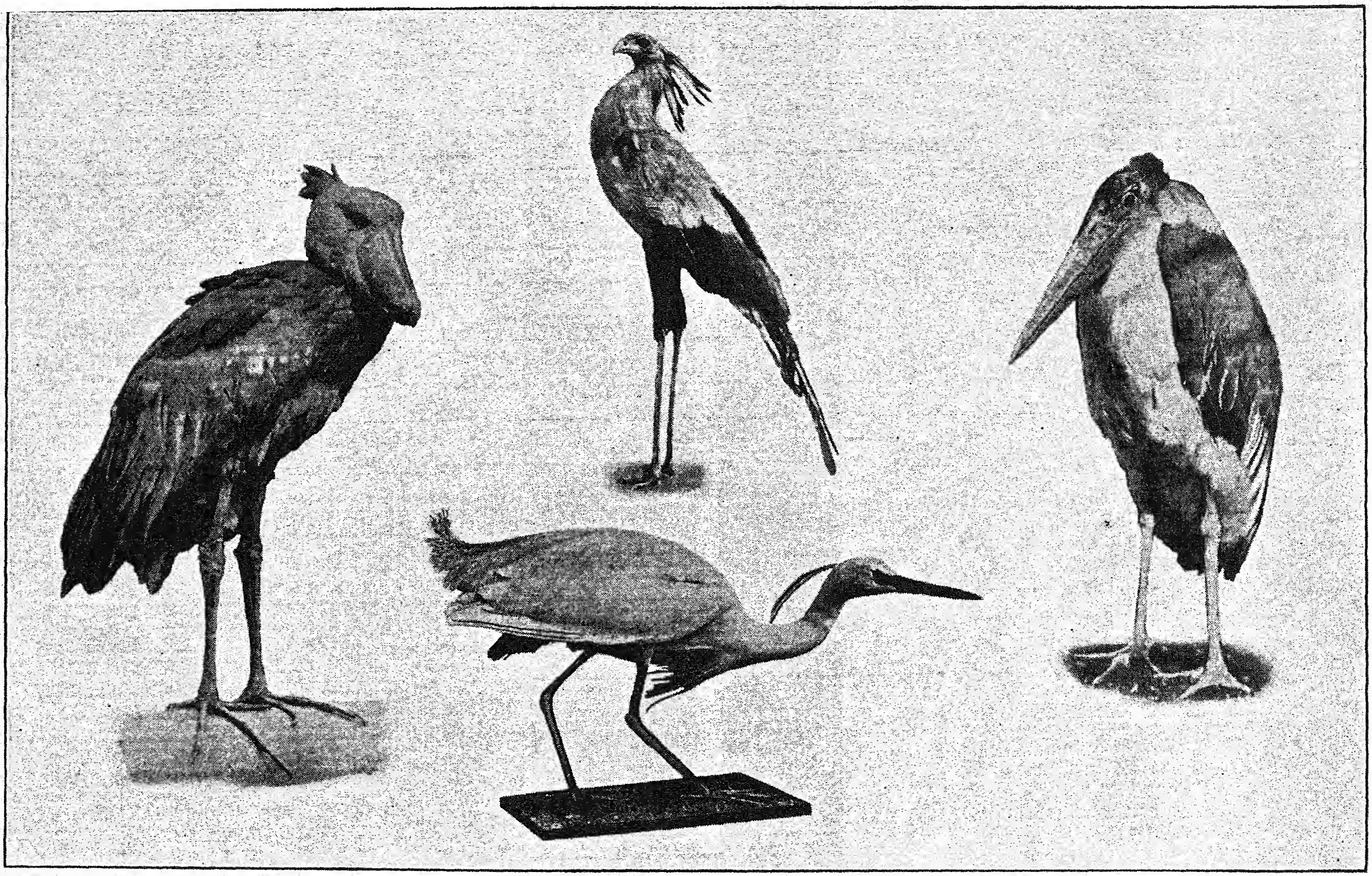
African Animals requiring Protection.

Barbary Stag, *Cervus elaphus barbarus.*

Fossa, *Fossa fossa.*

Abyssinian Ibex or Wali, *Capra walie.*

It should be noted that the illustrations differ in scale.



African Animals requiring Protection.

Whale-headed Stork or Shoe-bill,
Balæniceps rex.
Photograph by D. Seth Smith.

Secretary Bird,
Sagittarius serpentarius.

Little Egret,
Egretta garzetta garzetta.

Marabou,
Leptoptilos crumeniferus.
Photograph by D. Seth Smith.

It should be noted that the illustrations differ in scale.

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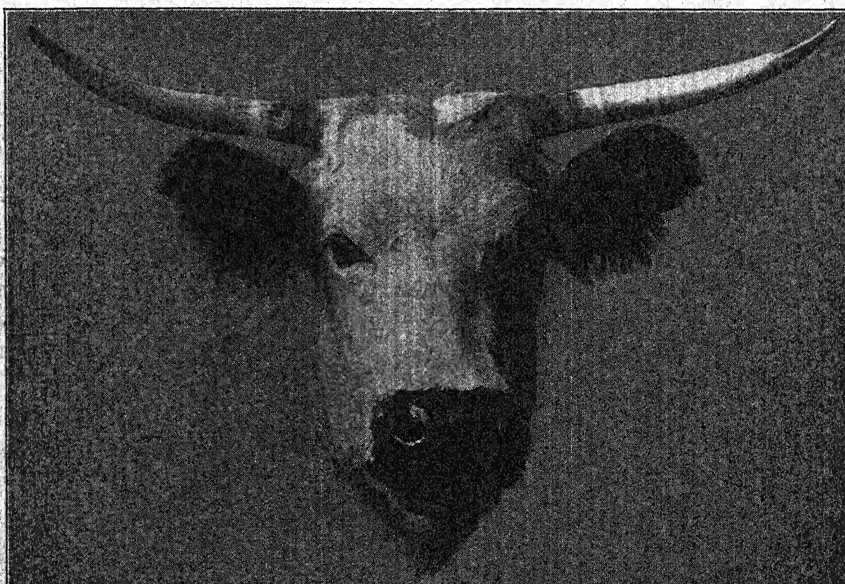

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A CHARTLEY COW.

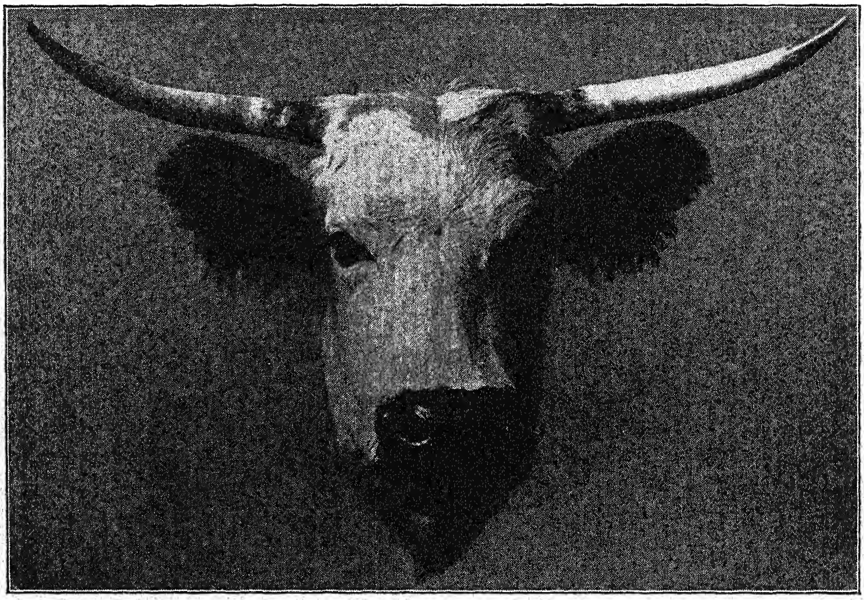
By GUY DOLLMAN, B.A., Assistant Keeper, Department of Zoology.

THE Chartley breed of cattle represents probably one of the few remnants of the British wild cattle which has existed until modern times. It is related to the Chillingham breed, but is very different in appearance.

Chartley Park, which was the property of Lord Ferrers until the year 1903, was originally formed by enclosing about 1000 acres of the great forest of Needwood in the reign of King Henry III. This took place about the year 1248 or 1249, and it is reported that a number of half-wild cattle, which then lived in the forest, were driven into and enclosed in the Park. These cattle undoubtedly gave rise to the modern Chillingham breed and may well have been the direct descendants of the British wild ox, *Bos primigenius*.

The Chartley cattle differ from the Chillingham breed in having their horns outwardly directed and wide spread, thus approaching the condition found in the modern longhorned breed, and very different from the upright horns of the Chillingham cattle. As with most Park cattle, the Chartley breed was continually producing black calves, and without strict weeding-out the breed would have become a black one. This probably had something to do with the disappearance of the Chartley breed, since the black calves were probably the hardier and more vigorous types, and this, combined with the continual inbreeding which was practised in the herd, undoubtedly led to the fact that in the spring of 1851 the herd was composed of less than 100 specimens. By the summer of 1874 these would appear to have diminished to 25 specimens, and a few years later only 20 were left, of which half that number were bulls. These had dwindled to 8 specimens in 1903, when the estate was bought by Colonel W. N. Congreve and this small remnant was removed to Woburn, the Duke of Bedford's estate, in the hopes that it might be possible to resuscitate the breed. Some of these specimens died off rapidly, and in the year 1908 only

one black bull and a white bull and cow remained. These two latter returned to Chartley for a time, but were once more brought back to Woburn. The white bull, the last pure-bred white one, was destroyed in 1910 and the skin was mounted and



HEAD OF A CHARTLEY COW.

is now on exhibition among the domesticated series in the North Hall of the Museum.

The head of the cow illustrated was presented to Mr. Godfrey R. Buckley by the late Lord Ferrers in 1910 and has recently been presented to the Museum by Mr. Buckley.

A VISIT TO THE ISLANDS IN THE GULF OF GUINEA.

By W. H. T. TAMS, Assistant Keeper, Department of Entomology.

(*Continued from p.* 176.)

Señor Bonelli was living in and using a little house (Fig. 35) near the Compania, as a meteorological station and had established a seismological station in the base of the Roman Catholic Mission a quarter of a mile up the road (Fig. 36). Mr. Exell slept at

the Company's house, where we both had our meals, but Señor Bonelli very kindly lent me the key of the mission, where I was able to fix up a camp bed and settle down to work quite comfortably. This Moka region is so remarkable that it is difficult to believe that one is in the Tropics. The distinguished explorer and botanist, Dr. J. Mildbraed, in the English account of the Duke of Mecklenburg's expedition in 1910–11, described his progress through the forest to Moka in the following words:

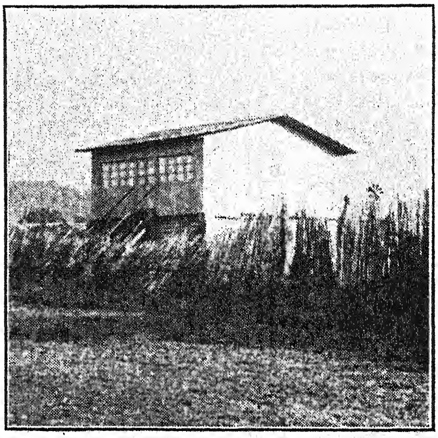


FIG. 35.—SEÑOR BONELLI'S HOUSE AND METEOROLOGICAL STATION, MOKA, FERNANDO PO.

The forest became more and more open as I ascended; the tree-ferns were more and more numerous, and after passing a few shrubs of *Mimulopsis violacea* in full flower, I was soon in the prairie. I traversed a narrow belt of tall elephant grass, and then at an elevation of 3600 feet there came into view the most beautiful landscape that I have ever seen. The ground rose in a gentle undulation and then sank into a wide, flat basin in the middle of which lay Moka. Here and there

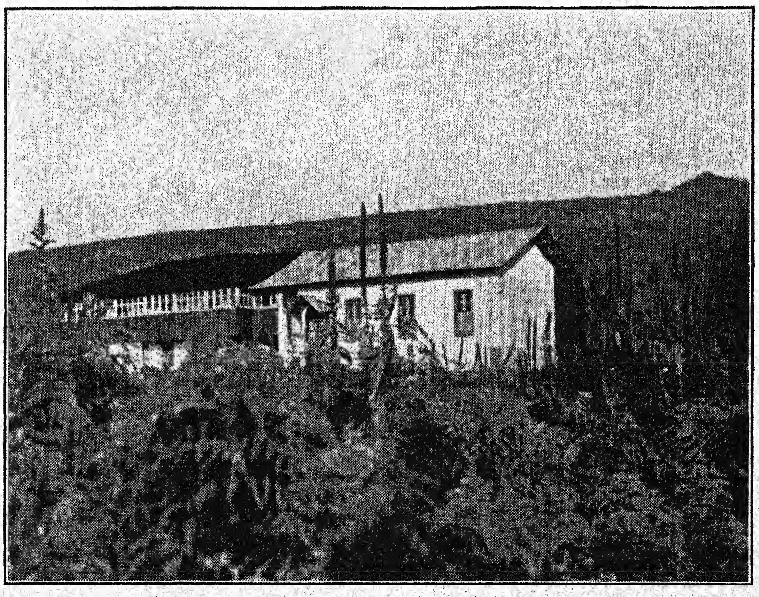


FIG. 36.—ROMAN CATHOLIC MISSION, MOKA, FERNANDO PO.

were picturesque little ravines through which trickled rivulets of clear water, and mounds with small craters at the summit.

The ground is covered with a luxuriant growth of grass, in which are scattered numerous trees which enliven the scenery and form a pleasant change.

As I wandered along the path, and trod the elastic turf in the bright sunshine, the air was so soft and fresh that I felt in the mood for singing, and I could scarcely realise that the dismal forest with its difficult paths, and the coast with its enervating hot-house atmosphere were so close at hand. So great is the charm of Moka that it influenced even my black companions. My boy from the prairies of the North-West Cameroons was quite excited; he pointed to the trees which also grew round his home, and admitted that they were almost more beautiful than those of his "own country," the highest compliment that he could pay.

Fig. 37.—Mioko Mineral Spring, Moka, Fernando Po.

In stating that the prairie land differs from the pastures of other African mountains, Dr. Mildbraed says:

That the mountain land of Moka is of comparatively recent date is proved by the fact that on its slopes are evidences of active volcanic action in the form of springs impregnated with carbonic acid gas. One of these springs may be seen at Loita not far from Musola, and another, which I myself investigated, at a place called Mioko (Fig. 37), at the foot of a ravine east of the Moka path. The water issues from several little shallow basins, in which it bubbles vigorously as if it were boiling in a cauldron. It is very refreshing and has a pleasant flavour; its temperature is 59° F. There is a similar spring at Balachalacha, between Moka and Concepcion, where the missionaries found the skeletons of birds and small mammalia that had come to drink and had been suffocated by the carbonic acid gas. The Loita water is used for drinking purposes by the Musola missionaries; it has been analysed, and is said to resemble Vichy water.

Mr. Exell and I went to Mioko with Señor Vidaror on February 1 and saw this wonderful mineral spring (Fig. 37). From the water I took a number of dead insects, one or two frogs, and a very nice little snake. One of the moths, of which I took two specimens, is, I believe, a new species. At Mioko there is a ranch belonging to the Compania, where we saw many magnificent bulls reared on the Moka prairie land.

I should like to spend a long time in this southern part of

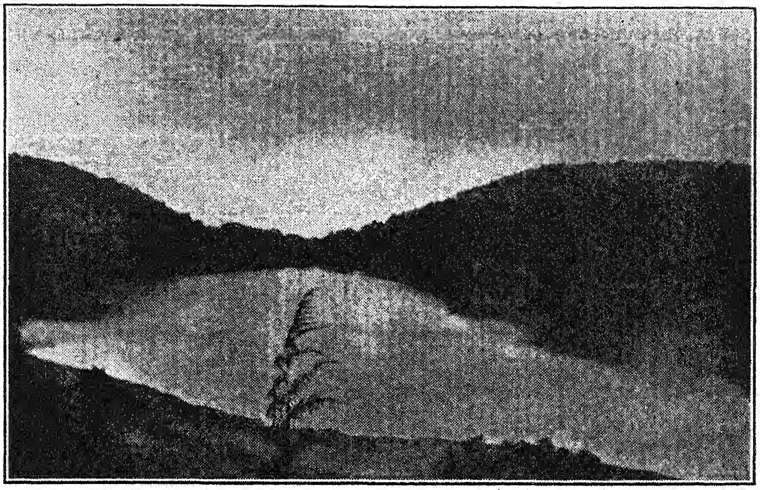


FIG. 38.—MOKA LAKE, FERNANDO PO.

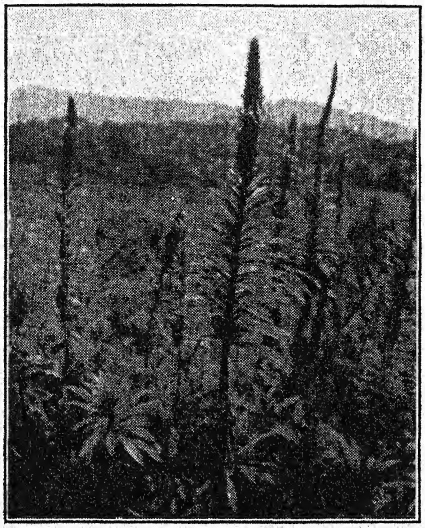


FIG. 39.—GIANT LOBELIA (*Lobelia columnaris*), AT MOKA, FERNANDO PO.

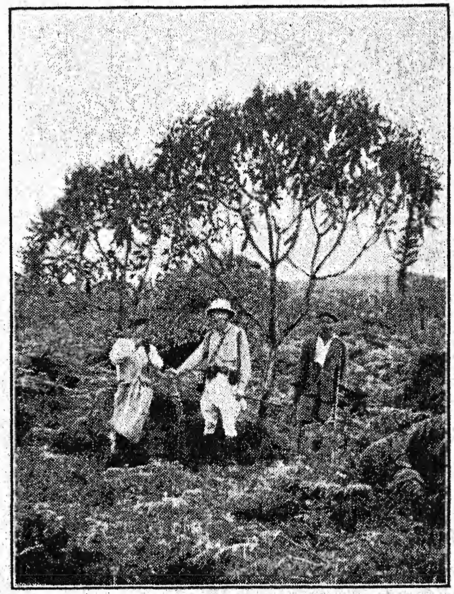


FIG. 40.—GIANT SENECIO (*Senecio Mannii*), AT MOKA, FERNANDO PO.
The author in centre.

Fernando Po, as I am sure there is wonderful collecting to be done not only at Moka itself, but also in the Cordilleras, which are still practically unexplored territory.

Of the insects I was most pleased with the Hemiptera Homoptera, of which there seemed a great variety. Moth collecting at night was fairly profitable, but the nights were terribly cold and very little came to my light after midnight. I was very grateful for the cognac with which Señor Vidaror each night fortified me before I left the house, but even then, heavily wrapped up as I was, I found it difficult to keep warm after midnight.

Fig. 41.—Bubis at Moka, Fernando Po.

On Monday, January 30, we went to the Lago de Moka, quite a big lake lying in a huge crater (Fig. 38). The level of the lake is, I believe, about 5900 feet, and the top of the crater wall from which the photograph was taken is about 6200 feet. At the Compania we were living at about 4000 feet or a little higher. On the way to the lake Mr. Exell took photographs of some of the "giant" plants, *Lobelia columnaris* (Fig. 39) and *Senecio Mannii* (Fig. 40). On the last day of January we visited a spot where we had a wonderful view of a cascade with a fall of 800 feet. We could unfortunately not spare the time to descend the precipitous slopes, but the district looked attractive in the extreme, very rugged and densely wooded. The prairie land of Moka covers perhaps some 90 square miles, and in this area some two or three hundred of the native Bubis live (Figs. 41, 42). These people keep very much to themselves, are very independent and apparently reluctant to work for Europeans. One very striking feature about them is the curious scars across their cheeks from the ear to the nose. One still sees some of the children with their faces slashed in this manner, but we were told that the practice is not so general as it was. We made no attempt to cultivate the acquaintance of these people in the

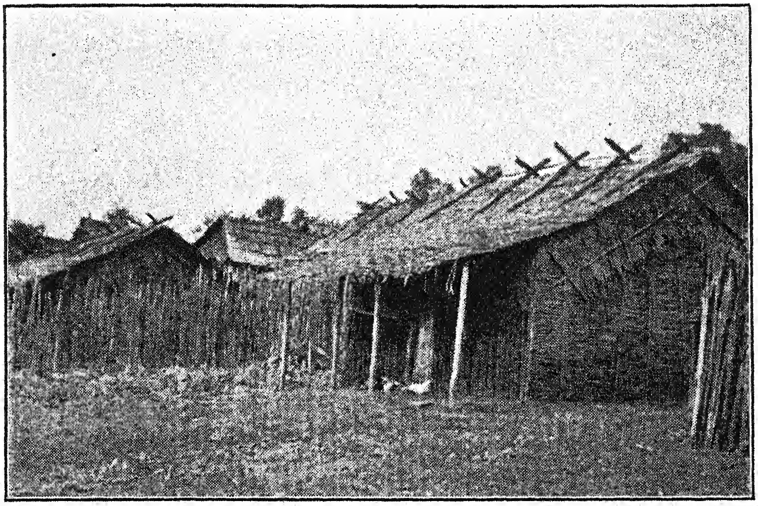


Fig. 42.—Bubi Huts at Moka, Fernando Po.

Fig. 43.—Large Orchid (*Lissochilus* sp.). Our police escort beside it.

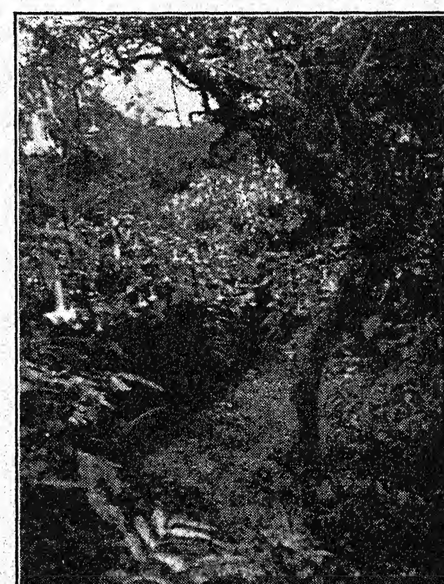


Fig. 44.—*Datura arborea* (introduced), Moka, Fernando Po.

two villages of Malabo (the King's village) (Fig. 42) and Bioko (his son's village), as our time was fully occupied in other ways.

On February 1 we paid the visit to Mioko (Fig. 37) described above, and on the way we found the magnificent orchid (*Lissochilus* sp.) shown in Fig. 43, and near the same path were to be seen several shrubs of *Datura arborea* (introduced from America) with their beautiful hanging white flowers (Fig. 44). The next day we could do little beyond packing up our collections. The night was bitterly cold, with brilliant moonlight, and very few

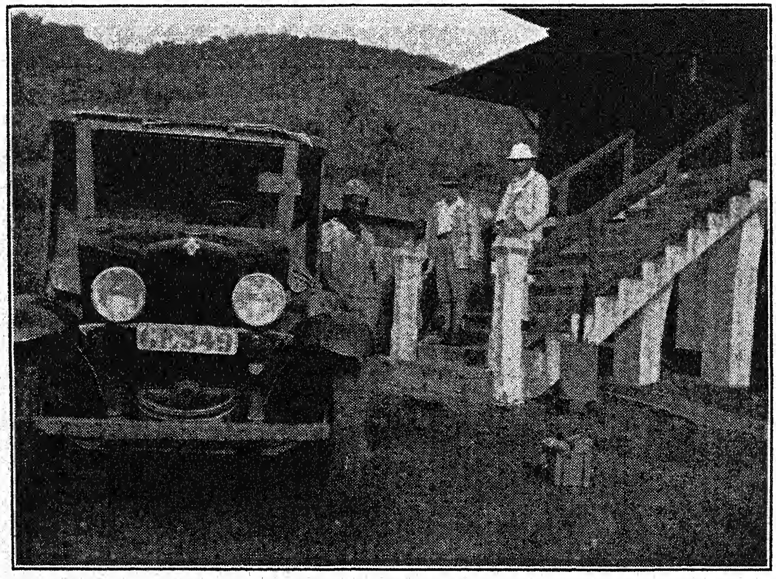


FIG. 45.—GENERAL LUIS VALDES AND THE AUTHOR AT RIASAKA, FERNANDO PO.

moths came to light. The following morning we completed our packing, and after lunch the Chevrolet arrived to take us down to Riasaka (Fig. 45). General Valdes at once sent our baggage down to Concepcion ready for the early morning boat (Fig. 46). The General's personal servant seemed in a very happy mood, and, when he brought us the beer for which his master had called, he greeted us with : " Welcome, Sirs ! " and proceeded to tell us that he was going to Spanish Guinea with the General. Next morning we were up at 4 a.m., leaving at 5.15 a.m., and arriving at Concepcion at 6.15 a.m. We had a grand run to Santa Isabel, General Valdes fathering us in his inimitable way, and rivalling our Principe host, Senhor Simões, in the lavish

way in which he endeavoured to prevent us from losing weight and strength before we got back.

FIG. 46.—LOADING VENESTA BOXES AT CONCEPCION, FERNANDO PO.

When we arrived at Santa Isabel, we went straight to the English Methodist Mission (Figs. 47, 48) to visit the Rev. George

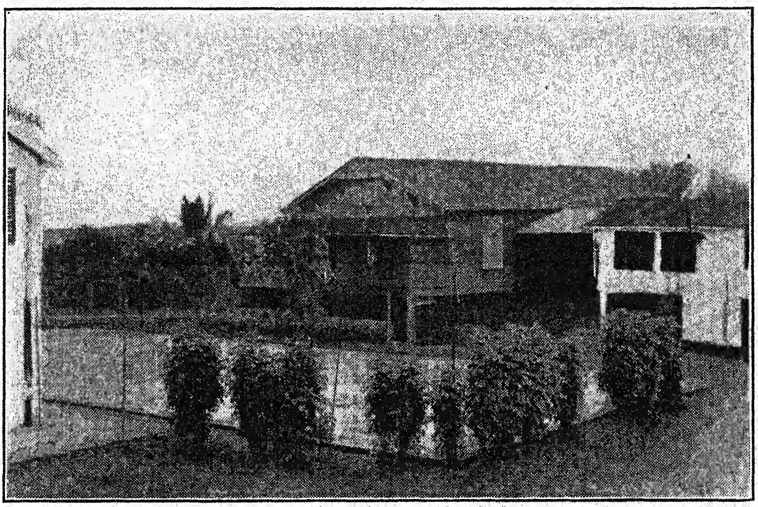


FIG. 47.—ENGLISH METHODIST MISSION, SANTA ISABEL, FERNANDO PO.

Bell, from whom we had received a very kind letter, and we asked Mr. and Mrs. Bell if they could put us up for the week-end, until we could get on the boat for Annobon. They not only made us

very welcome and comfortable, but, when we left, told us to come straight up to the Mission on our return. On February 6 we were presented by the British Vice-Consul to His Excellency the Acting Governor-General of Spanish Guinea, whom we had missed on our arrival, and we were able to thank him for his assistance in sending us information about the launch "Conscolsa," and in providing our Police escort. In the evening, through the kindness of Mr. Wilson of the Ambas Bay Trading Company, we had the pleasure of hearing the British Broad-

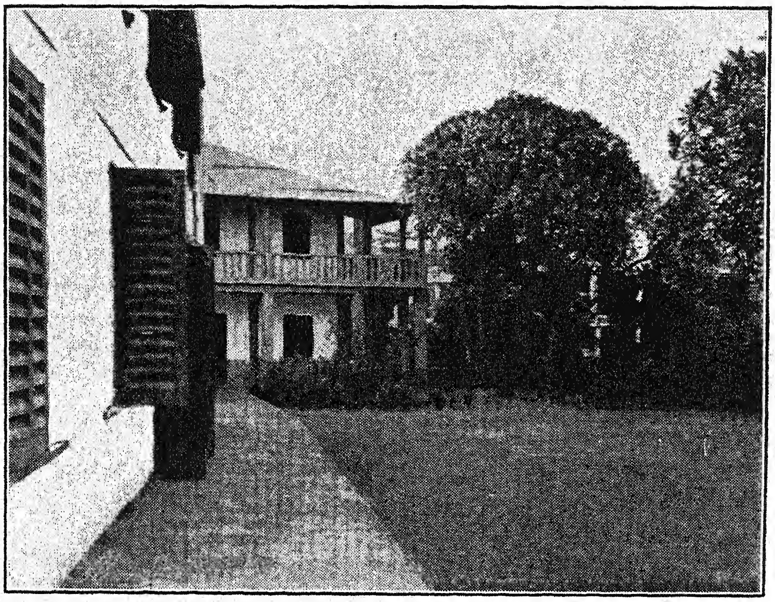


FIG. 48.—OUR QUARTERS AT THE MISSION.
Frangipani in bloom.

casting Corporation's West African transmission, which came through very clearly in spite of atmospherics, and it was a great pleasure to hear "Big Ben" and the "Second News Bulletin" so far from home. Mr. Wilson further earned our gratitude by placing his car at our disposal for a run along the new road to Botonos, fifteen miles from Santa Isabel. This is the first half of a motor road to link up San Carlos overland with Santa Isabel, an improvement which will effect a considerable saving of time, as at present the journey to San Carlos has to be made by sea. There is already a motor-bus service to Botonos.

We went aboard the motor-vessel "Plus Ultra" (Fig. 33), which sailed at 2 a.m. on February 8, on the slowest voyage

we made during the whole trip. We called first at San Carlos, and then headed for the continent, where we stayed at Bata till February 12, touched at Benito the next day, and arrived at

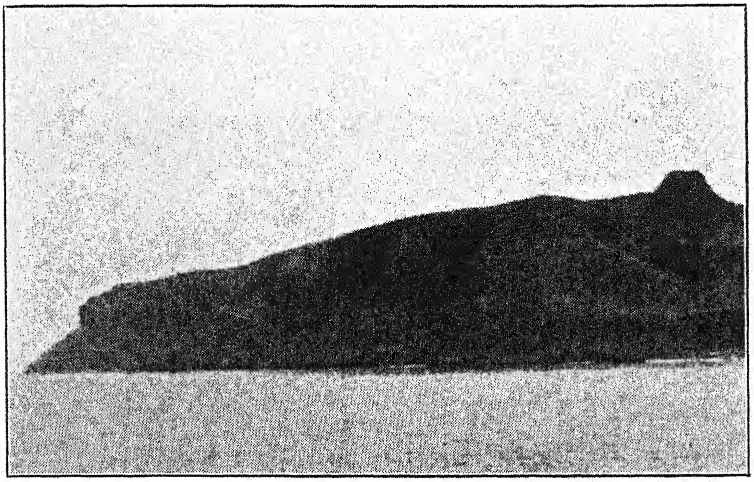


FIG. 49.—NORTH COAST (EAST HALF), ANNOBON.

Annobon (Figs. 49, 50) about 8 a.m. on February 15. We were fortunate in having aboard the "Plus Ultra" the members of a Commission sent out to investigate the possibilities of Annobon as a penal settlement; for this meant that the boat was to remain at least one night off the island. So we went on shore as soon as possible, picked up a couple of native boys and set out for the crater lake (Figs. 51, 52), which is about 900 feet up. After lunch I collected a few insects, which were very scarce, and spent some time trying to catch some dragon-flies, to do which I had to wade in the lake. However, as we wanted to go up the Pico do Fogo (Fig. 51), I had to desist. I succeeded, however, in catching some specimens of a pond-skater, which I hope will prove interesting. We continued our way up the mountain, but the two boys evidently did not know of a path to the summit in spite of the fact that they said they did, and we finished up in the woods on the steep slopes, where amongst

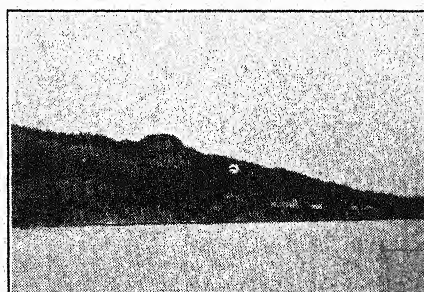


FIG. 50.—NORTH COAST (WEST HALF), ANNOBON.
Showing Roman Catholic Mission.

various trees grew wild orange trees with a fine show of refreshing fruit, very juicy but rather bitter. We returned to the ship in the afternoon, Mr. Exell suffering somewhat from the effects of the hot sun. The following day, Mr. Exell not feeling well enough to tackle another trip in the sun, I set off alone and began to collect just beyond the Mission; but there was so little about that I started to climb and finally went up the Pico do Fogo (Fig. 51), but did not go to the top. I took some rock specimens at about 1200 feet, but the other 275 feet required some dangerous

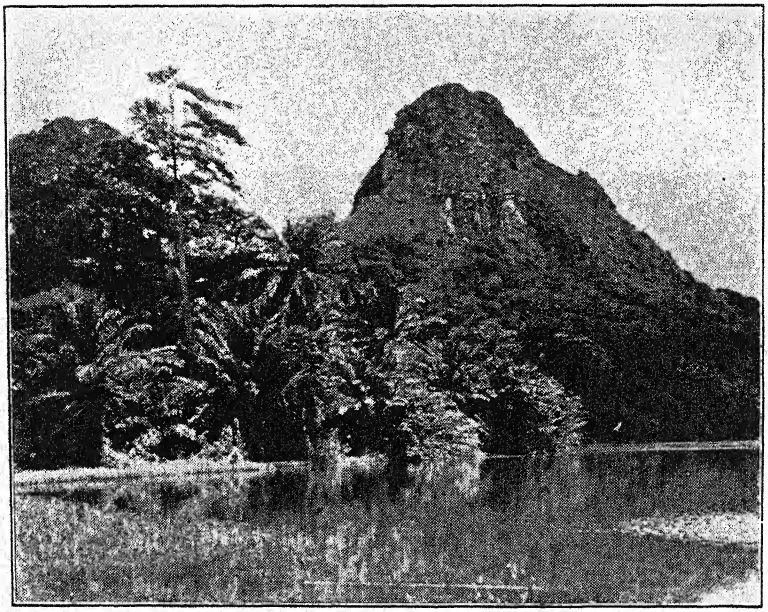


Fig. 51.—Pico do Fogo, with Crater Lake, Annobon.

rock-scaling from where I was, so I decided that it would not be wise to attempt the feat alone. I was fortunate, because, on returning to the village of Palé, I found the members of the Commission waiting for the ship's launch, on which they were to make a tour round the island, and the doctor very kindly asked me if I would like to go with them. I gladly accepted, and, though we did not land anywhere as I had hoped, I enjoyed the trip immensely, and I was pleased to see that there is still plenty of untouched forest on Annobon. I also had an opportunity of seeing from a distance what Dr. Mildbraed describes as "surf geysers." The effect is very remarkable, for there is one spot in particular where the waves strike a perforated rock in such a

fashion that a jet of spray is forced up for a considerable distance and sometimes looks like the puff of smoke from a big gun. In the early morning of the following day (February 17) we left for Kogo, which we reached at 11 a.m. on February 18 in a rainstorm; so we did not go ashore. Next day we reached Bata. I went ashore alone the second day at Bata, where I had an interesting time from every but the natural history point of view, although I took a long walk out beyond the town, without seeing very much beyond a common butterfly or two. I found General

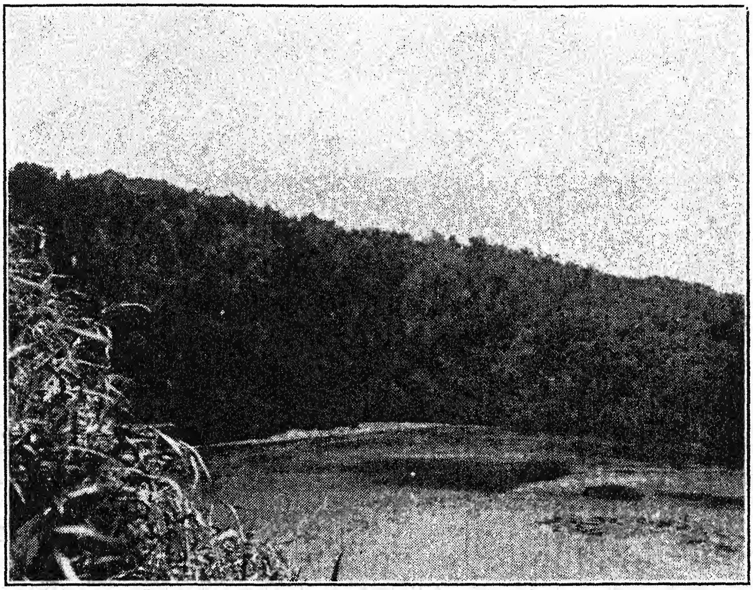


Fig. 52.—View of Crater Lake from Pico do Fogo, Annobon.

Valdes on board when I got back, and we sailed at 4 p.m., arriving at Santa Isabel in the morning. Mr. Bell met us and ran us up to the Mission in his lorry. At 4 p.m. on the following day we suddenly got news of the arrival of the Dutch boat "Amstelkerk." Although we had planned to return on the "Plus Ultra," the fact that we could not book our passages through and that we could not leave our trunks on the boat and return there at night to sleep, caused us to change our minds and return on the "Amstelkerk," and we were afterwards glad that we did so, as we had to admit that the food on the Dutch boat was infinitely preferable. We had a hectic three hours rushing round to the Bank, Shipping Agents, and Police, only to find that it was a false alarm so that we were able after all to fulfil a

dinner engagement. On the following day after lunch, I set out to walk to Basilé, five miles off and 2000 feet up Clarence Peak. The whole way lay through cultivated country, ending in the pretty village of Basilé, with its quaint Mission. I was rewarded by getting a view of Cameroon mountain, though I could not see the summit.

At last the time came to say farewell, and on Sunday, February 26, we sailed for Lagos, where two days later we set foot on shore in a British colony in Africa for the first time. At Accra we took on board a cargo of cocoa that occupied the whole day to load, providing us with a continuous entertainment. At

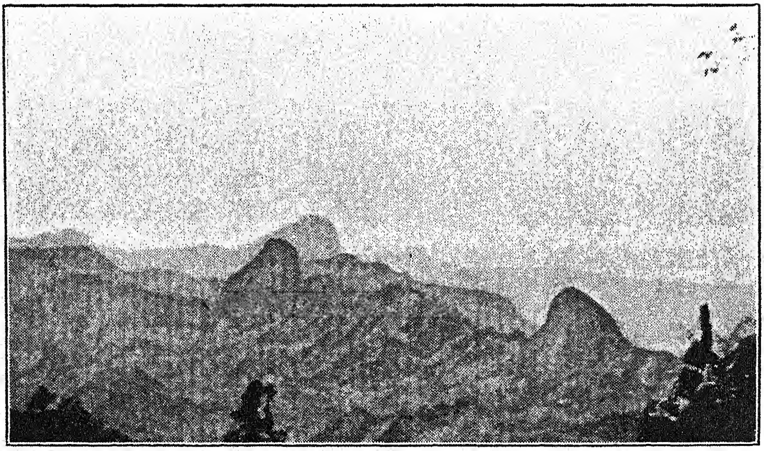


Fig. 53.—Mountain Scenery, São Tomé.

Takoradi we learned that there was yellow fever at Sekondi, while we were not allowed ashore at Freetown because of a smallpox outbreak. On March 10 the sea became rough towards night and at midnight next day we reached Las Palmas. We reached Le Havre on the evening of March 17, to find that there was no cross-Channel boat on Friday; so with two friends, who joined in the enterprise, we chartered a car and drove to Dieppe, unfortunately missing the midnight boat. However, we caught the delightful steamship "Rouen" the next day at 1.30 p.m., and she landed us at Newhaven at 4.40 p.m. to the minute.

All told, a successful and enjoyable trip, from every point of view.

And now, having looked over what I have written, how many things I find I have omitted, or have not adequately presented.

São Tomé, with its great mountain chain covered with a

dense cap of cloud, was a magnificent spectacle when we saw it the first time from the sea, and contrasted strongly with the blue skies to which we had become accustomed on the way out. Inland its mountains are rugged, producing beautiful scenic effects (Fig. 53), and the most weird visions are to be seen sometimes of spectral trees shrouded in mist (Fig. 54). The coastal scenery too is most attractive (Figs. 55, 56, 57). The town, of which we saw something at different times, is quite pleasing, and there are many quaint sights to be seen there (Figs. 58, 59).

Fig. 54.—Spectral Trees in Mist, São Tomé.

Principe, smaller than São Tomé, is even more rugged, and some of its mountains are absolutely fantastic. Two or three of the queer excrescences of this strange and beautiful island

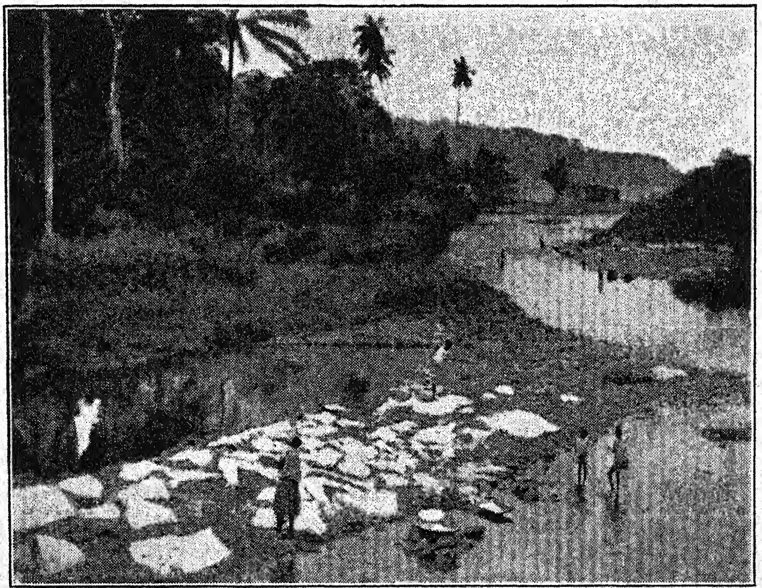


Fig. 55.—River Scene, São Tomé.

Fig. 56.—Coconut Trees on Beach, São Tomé.

resemble gigantic monoliths (Fig. 60), more than they do mountains, and the verdant tropical vegetation, whether it be natural forest or plantation, reaches down to where warm gently moving seas lave sands of palest gold.

Fernando Po, the most imposing island of the four, with Clarence Peak, towering high into the shimmering air and rivalling the Great Cameroon Mountain, sometimes visible across the strait, has been described as the "pearl of the Gulf of Guinea," and one feels that it still holds in its mountain forests many plants and insects that would well repay anyone living there any trouble to which they might go in collecting and studying them.

Annobon, isolated and inaccessible, was not very generously

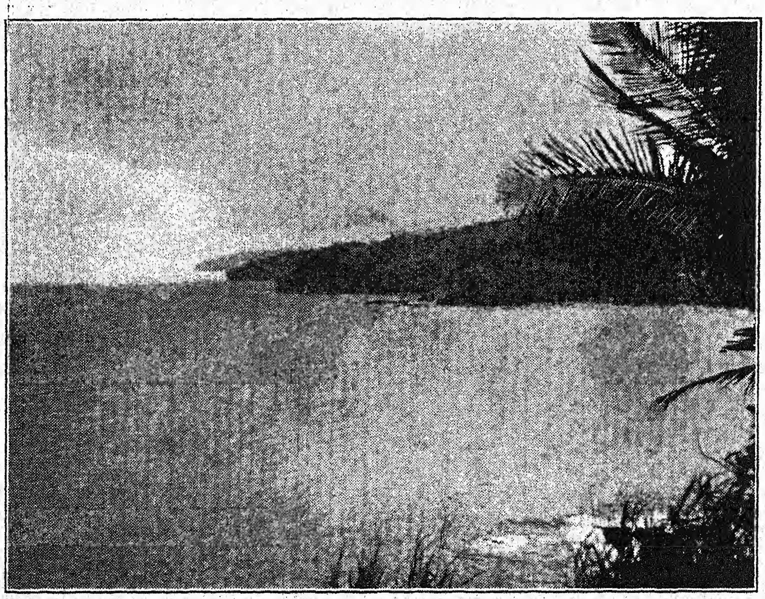


Fig. 57.—Coast Scenery, São Tomé.

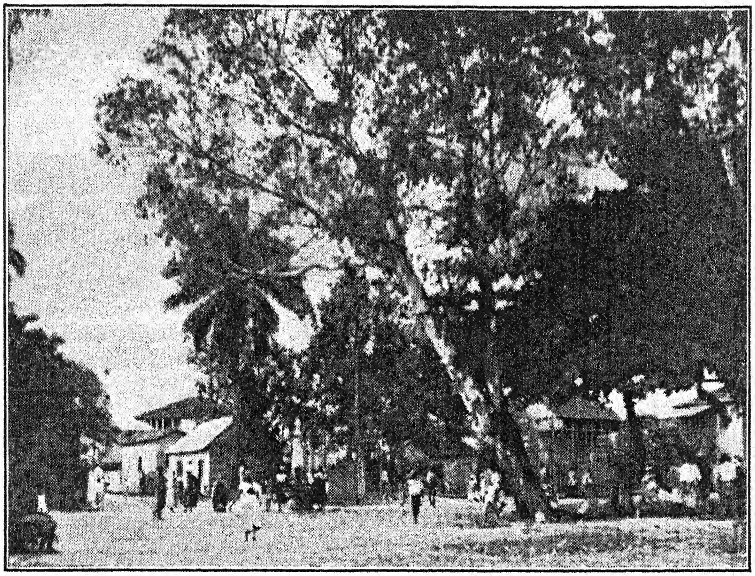


FIG. 58.—OUTSKIRTS OF TOWN, SÃO TOMÉ.

described by Boyd Alexander, who, after visiting it a quarter of a century ago, wrote:

> Annobon is a volcanic rock rising abruptly out of the sea and clothed with scrubby growth towards the top.

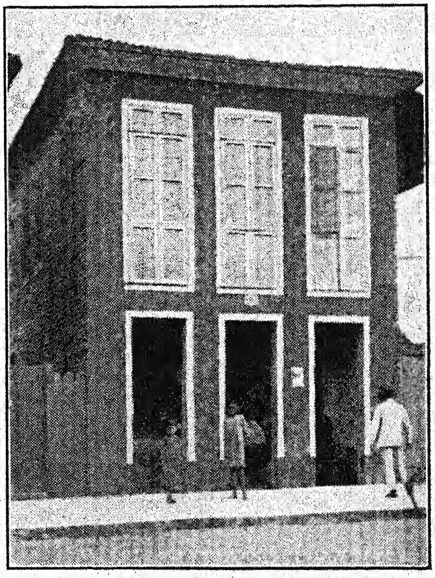


FIG. 59.—WINE-SHOP, SÃO TOMÉ.

My feelings about it are warmer than that. It may not possess a great variety of plants, or a great abundance of insects; but it is a very beautiful spot, and I do not think even its natural history resources have been fully exhausted yet. We had hoped very much to have been able to spend long enough in Annobon to camp by its picturesque lake, with the Pico do Fogo towering above; but two days was far too short a time, and we did not dare to risk being marooned there for a month, as our resources were beginning to suffer a little strain; for once

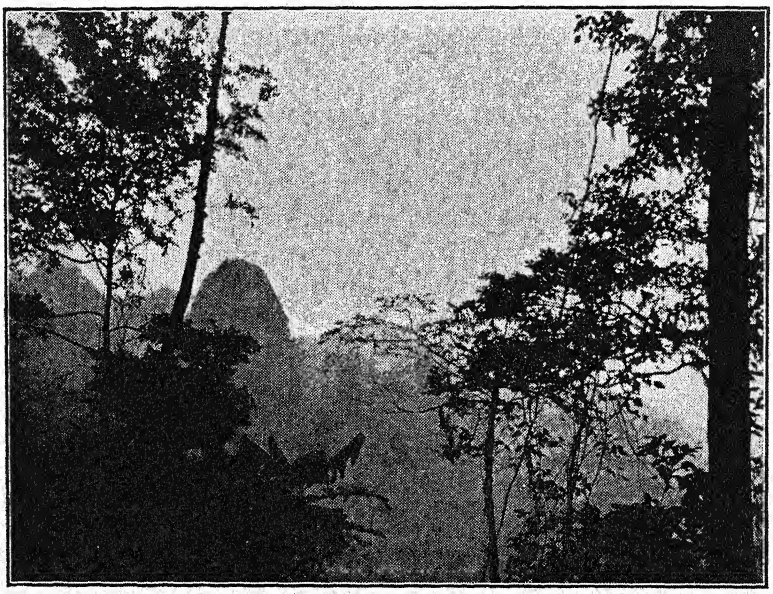


Fig. 60.—Mountain Forms, Principe. View from Monte Papagaio.

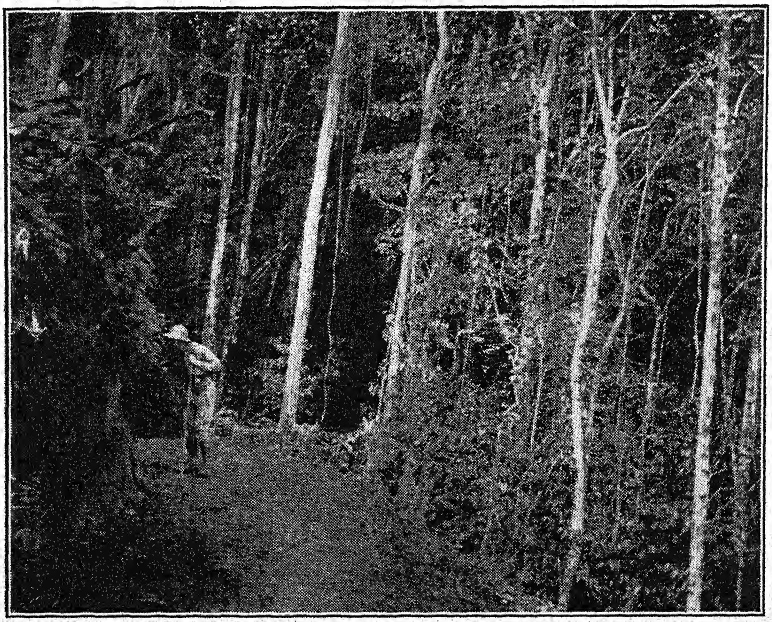


Fig. 61.—Forest Edge, São Tomé.

landed in a place like Annobon without a boat in the harbour the prospect of getting away even in one month is not great, and a prolonged stay of two months would be much more likely to be one's fate.

Fig. 62.—Conopharyngia Flower, São Tomé.

In all four islands the forest scenery was extremely beautiful, and I may be wrong, but I somehow feel, without being able to assert it definitely, that in each island the forest was different. Certainly that of which we had the most experience, the dripping, scented forest of São Tomé, was quite characteristic, with its tall pale trunks (Fig. 61); its enormous lianes hanging like huge hawsers between the slender trees; with here and there a magnificent display of the scented, cream-coloured flowers of the conopharyngias (Fig. 62), or the lovely begonias with their great leaves and pinkish-white flowers (Fig. 17); its great clumps of *Costus giganteus* (Fig. 63), hiding between the bases of the huge leaf-stalks the

Fig. 63.—*Costus giganteus*, São Tomé.

curious red inflorescences with their brilliant yellow florets; the remarkable profusion of epiphytic ferns and orchids, the long

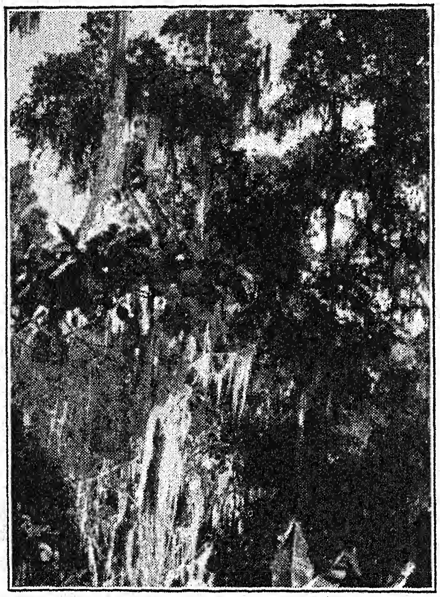


Fig. 64.—Lichens, São Tomé.

wisps of beard-like lichens (Fig. 64), and last, but by no means least, the singular tree-ferns, perhaps one of the most delightful features of these island landscapes (Fig. 65 São Tomé; Fig. 66 Moka, Fernando Po).

I cannot continue in this strain indefinitely, though there are so many things that one would like to comment on, things almost forgotten until one starts to review the experiences of such a trip as this. I have said little about the natives we met: serviçais from Mozambique, Angola, and the Cameroons; the native Foras of São Tomé (Fig. 67); and the Bubis of Fernando Po (Fig. 41). I feel something of the enthusiasm of Count Hermann Keyserling, who, in his delightful book "The Travel Diary of a Philosopher," says:

> All men whom I have seen here are beautiful. The negroes, especially in their bodies; the Arabs, who gallop past me again and again through the sandy streets on their noble steeds, in their characteristic heads! These men are as fair as animals; their bodies are equally expressive.

Fig. 65.—Tree-ferns, São Tomé.

I, too, have nothing but admiration for these natives who always live in the sun.

With perhaps an unfortunate descent from the sublime to the ridiculous, I feel I must make a small

observation on food, because, although we experienced all sorts of food on our travels, we were unanimous about one, even if we did not see eye to eye over others. We both hated with a mighty hatred one of the popular Portuguese dishes, a kind of dried cod-fish, called baccalhao; I will say no more about it than that. We tried many tropical fruits, but for my part, I assert my preference for three: the banana, the pineapple and the orange, though I will go so far as to say that I do like mangoes

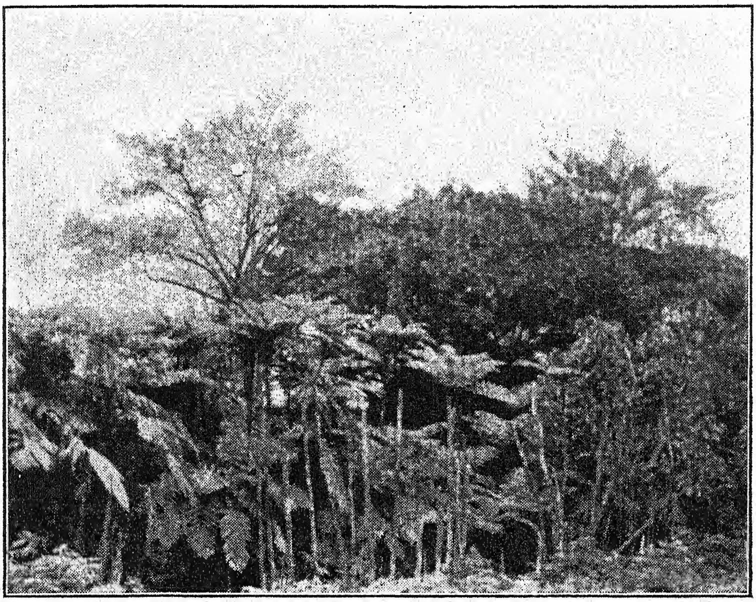


Fig. 66.—Tree-ferns, Moka, Fernando Po.

very much. But mangoes are a little too juicy for real comfort; I like a fruit of which I can keep the juice in bounds.

Did we make any mistakes, or forget anything? Of course we did. There are one or two things that should be mentioned. First, as to photography. I was a little afraid of film-packs, as they so easily get fogged. I need not have feared them. I took cut-films and plates and often had great difficulty in handling them; whereas with panchromatic film-packs I could have done much more photography than I actually did. Also I used a colour-filter, and the light being somewhat deceptive, I under-exposed frequently. The roll-films in tropical packing used by Mr. Exell were quite satisfactory.

I took petrol lamps for attracting moths to light. They were admirable; but I am told that the light is much less attractive

than that of acetylene lamps. I believe that the petrol lamps are lighter in weight than the others, and one can get petrol almost anywhere in these days.

On the whole, we took too much with us in the way of equipment, rather than not enough; but we were not hampered in any way as a result, and I think the provision we made was on the safe side.

Fig. 67.—Fora Girl, São Tomé.

And finally, I am sure that I have omitted to pay proper tribute to some of those charming people, to whose unfailing kindness we owe so much of the success of our venture. Of some of them we did not discover the surnames, *e.g.* Senhor Fernandez at Infante Dom Henrique and Senhor Henriques at Terreiro Velho; or have no exact record of the name, as in the case of the Port Captain of São Tomé. To the Padre Martinho Pinto da Rocha we are indebted for the present of a large snake and its eggs. To Senhor Alberto Portulez and his colleagues of Messrs. Lima & Gama, Limitada; Senhor V. J. Pimenta, Manager of the Banco Nacional Ultramarino at São Tomé; Mr. W. H. May, Manager of the Bank of British West Africa at Duala, where also we were treated with great kindness by Mr. Brough (British Vice-Consul), of the John Holt Company, and Mr. Verbeek, the agent of the Holland Line; to these, and to all who in any way contributed to our happiness, well-being, and success during our wanderings, it is a great pleasure to be able to make this public expression of our gratitude.

(*Concluded.*)

BEHIND THE SCENES IN THE MUSEUM. VI.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

The science of geology is concerned with the structure and composition of the Earth's crust, that is, it deals particularly with minerals, metals, and rocks; their nature, manner of formation, and history. It includes in its broad sense the study of the plants and animals which lived in earlier times as we know them from their remains preserved by natural means in the rocks. From the fact that these evidences of former life have usually to be excavated or dug out of their enclosing material, the plant or animal remains are known as fossils (Latin, *fodere*, to dig). The science that is concerned wholly with the study of fossils is known as palaeontology (Greek, *palaios*, ancient).

In the Museum the detailed study of the nature and classification of minerals, metals, and rocks is the work of the Department of Mineralogy, while the practical study of fossils and their arrangement is the function of the Department of Geology, which is therefore very largely a Department of Palaeontology. The student of fossils must therefore be familiar with the principles of geology on the one hand, and with the facts of zoology on the other, so that he may be able to trace something of the difficult pathway along which life has journeyed and may know something of the long and imperfectly recorded history of its travellers.

How, then, is the Department of Geology arranged, and how does it go about its work? The scientific staff consists of the Keeper, Dr. W. D. Lang, F.R.S., one Deputy Keeper, and seven Assistant Keepers, aided by three full-time unofficial workers; while the clerical and technical staff numbers sixteen, their duties varying from highly skilled work in reconstructing skeletons and making casts in plaster and other media to typing, cataloguing, and attending upon the scientific staff. In personnel the Department is therefore smaller than its Zoological and Entomological neighbours, but its storage and exhibition space is of necessity considerable, while the technical methods that are employed in preserving and studying fossils demand well-equipped workshops and a very specialized staff.

The exhibition galleries of the Department together with some of the studies of its staff and its library occupy the whole of the eastern half of the Ground floor of the Museum, and in the Basement are further studies, the store-rooms, and the

workshops. The public galleries are ten in number, and although these are by no means " behind the scenes " they are much more used by members of the Staff in their daily work than is the case in most of the other Departments. The visitor will probably notice that, while many of the exhibits are in centre- or wall-cases, most of the fossils are shown in table-cases, with cupboards underneath. This is a convenient method of combining exhibition and storage space, for the cupboards contain numbered drawers, in which is stored much of the reserve collection. Practically every day these specimens are used, either by members of the Department or by scientific visitors and students.

The collections have been amassed in many different ways: by gift, by exchange, and by purchase. Many are the results of expeditions organized in the Department, others are from expeditions not primarily connected with the Museum. The large fossil-reptile bones from Alberta in Canada and from Tanganyika Territory in East Africa are examples of the former, while the Mount Everest parties and expeditions to the Arctic and Antarctic have contributed to the latter category. Members of the Departmental Staff occasionally make collecting journeys, and within recent years important series of fossil fishes from Madagascar and remains of mammals from East Africa and the Mediterranean region have been added to the Museum in this way.

It will be realized that making such collections is not an easy task. Peculiar conditions favour fossilization, and only certain kinds of rocks are fossiliferous. While some fossils are easily located in certain districts, such as the Dorset Coast and part of the Yorkshire Coast, others can only be obtained after a well-directed and difficult search which is not unlike the proverbial hunt for the needle in the haystack. Only seldom are the larger fossils found in any state of completeness, and they are often very fragile so that a very specialized technique in their treatment has had to be evolved.

Fossils of microscopic size may be obtained from certain clays; moderate-sized specimens, such as the various kinds of shells, corals, and sea-urchins, are often found besides in sands and limestone; and large specimens such as the various fossil fishes, the great extinct reptiles, and mammalian and human remains are found in many kinds of deposits. In every case, however, steps must be taken in the Museum to extract the specimen from its adherent rock (matrix) and where necessary to piece the fragments together before examination can be made or the specimen be placed on exhibition.

However or in whatever kind of rock the specimen is discovered, it is seldom safe merely to place it in a box and send it to the Museum. Many specimens are extremely friable and would be hopelessly shattered by the shocks received during transport. Small specimens need only careful packing in a more or less elastic medium such as straw, wood-wool, or newspaper; earth or sawdust should never be used. Large specimens, especially skeletons, are usually freed partly from the matrix

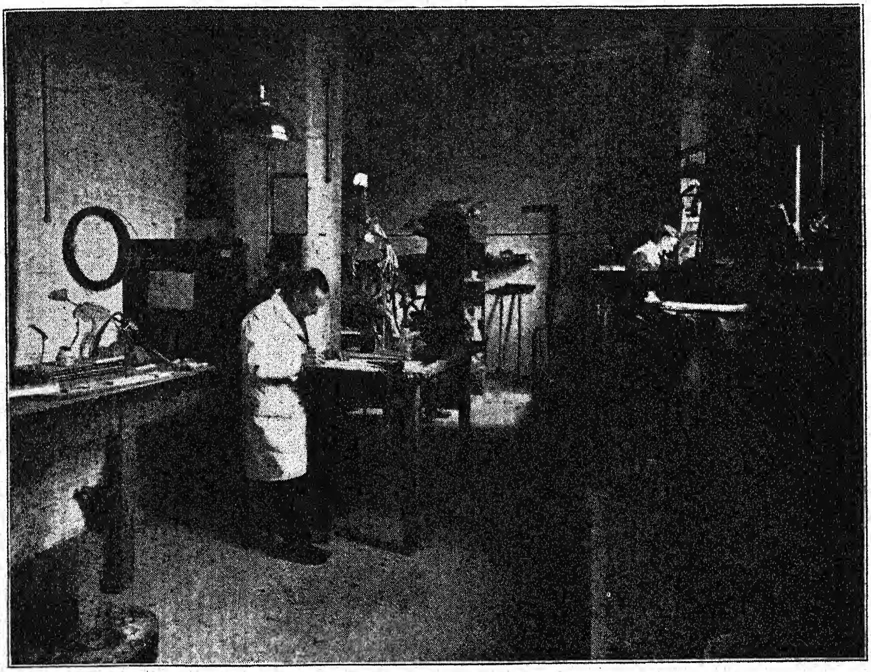


Fig. 1.—Department of Geology: Preparators' Shop (1).

in the field and subsequently wrapped in bandages of burlap or canvas cloth soaked in liquid plaster of paris.

Unpacking a fossil collection on arrival at the Museum therefore calls for no less care than does any other kind of fragile material, and the subsequent workshop treatment is often a long and always a careful business if results of value are to be obtained. A good fossil is literally priceless in that it cannot be replaced, though it can so easily be destroyed.

There are two Preparators' Shops in the Department of Geology; the one of which deals with the development of fossils and the assemblage of the constituent parts into an exhibition or study specimen, while the other is chiefly devoted

to making casts of original specimens in plaster or some other medium or casts from natural moulds. In the first of these shops (Fig. 1) most of the necessary work between arrival and study is done with a number of mechanical aids.

Clays containing fossils of minute size are "washed" in the workshop; that is, the material is broken up in a sieve and a continuous stream of water is passed through a whole series of sieves to a large basin. By examining the various siftings the small fossil shells are easily obtained, especially if the material be put in a bowl of water, when the little plates and pieces of shell will often float to the surface.

Moderately sized fossils, of a few inches to two or three feet in length, are best developed out of their enclosing matrix by means of an ordinary hammer and chisel. A series of light taps are far better than heavy blows, and the skilled preparator can by such simple means uncover the fossil from its rocky protection. Other means than hammer and chisel can also be used in the Museum for the extraction of fossils. The dental drill, awe-inspiring in certain circumstances, is capable of many modifications for palaeontological purposes, and it is used considerably in the Department for the fine development of fossils, often in conjunction with a binocular microscope. A pneumatic hammer, a modification of the all-too-familiar road-drill, is also installed in the workshop and is of great value in the preparation of large skeletons. By the regulation of the size of the compressed air outlet varying degrees of movement can be obtained on the chisel-like tool and large specimens like *Scolosaurus*, in the dinosaur gallery, and the fragile and unique *Archaeopteryx*, in the fossil bird pavilion, have been worked out by this means. It will be easily realized that such work must be done with extreme care as the slightest slip in dealing with the hard matrix would probably shatter the skeleton or shell under treatment.

Another method of extracting small fossils such as molluscs and brachiopods is provided by the coal gas-oxygen flame. The matrix is heated to a high temperature and then plunged into cold water when, at least theoretically, the fossil jumps out.

For sectioning large blocks of stone, bones, teeth, corals, etc., either the ordinary rotating disks of the lapidary or an electrically driven band-saw are available, while a steel-jawed press is used for reducing awkward or unduly large blocks to more convenient dimensions.

There are many other devices and pieces of apparatus available in the Geological workshops, so that the fossil may be

extracted from its age-long stony covering and made accessible for study, but the use of them, if successful results are to accrue, demands skill, time, and patience. With small invertebrate fossils the whole specimen may be obtained more or less entire, but with large vertebrates it is but seldom that such a happy result is possible. The various bones and pieces of bone have to be separately developed and then arranged into an articulated skeleton, a process rather like a jig-saw puzzle.

Before a mounted skeleton can be put on exhibition or indeed handled safely the bones must be hardened and protected by means of a preservative, and for this many materials and processes can be used according to the nature of the specimen and the particular conditions under which it will be exhibited or stored. The standard material is amber shellac dissolved in methylated spirit, but celluloid and amyl acetate, gelatine, and several proprietary substances are also used.

As has been indicated, not all specimens are capable of such treatment, as some are known only from impressions. In such cases it is necessary to take a plaster, wax, or gelatine composition cast from the natural mould and subsequently study the fossil as represented by this reproduction. It is often necessary to make casts of partial or complete specimens for the purposes of exhibition, gift, or exchange. The description of the technique of casting is unnecessary here; besides, it would be both tedious and misleading, for, however simple its description may be, the actual operations demand skill and the utmost care, as specimens may be ruined by inexperienced or careless treatment. A very great deal of casting in various materials is accomplished in the Department, not only for Departmental purposes but also for many other institutions at home and abroad, and most of this work is done in the second workshop (Fig. 2).

But treatment in the workshop is not the end of the story. Several routes are open to the new acquisition. It may be used for study, for exhibition, it may be stored, or it may be a duplicate and as such be transferred to some other institution, or it may suffer or enjoy a combination of these experiences. Whatever fate is in store for it, it must first be registered. The particulars of its origin, name, age, and birthplace in the geological sense are duly recorded and card-catalogued, and it is then given a distinguishing letter and number on a small adhesive yellow paper disk.

Each member of the Scientific Staff has his particular systematic palaeontological group. To him are referred the

appropriate fossils and it is he who names them, and, if necessary, provides them with a published description and illustration. Often such descriptive reports cover many specimens and are of considerable size and great scientific value. It is perhaps not generally realized that before a living or fossil animal or plant can be officially given a scientific name it must be described in a publication, and the specimen which forms the basis of the name and the description is then called the type-specimen and is of considerable value, as it must subsequently be referred to

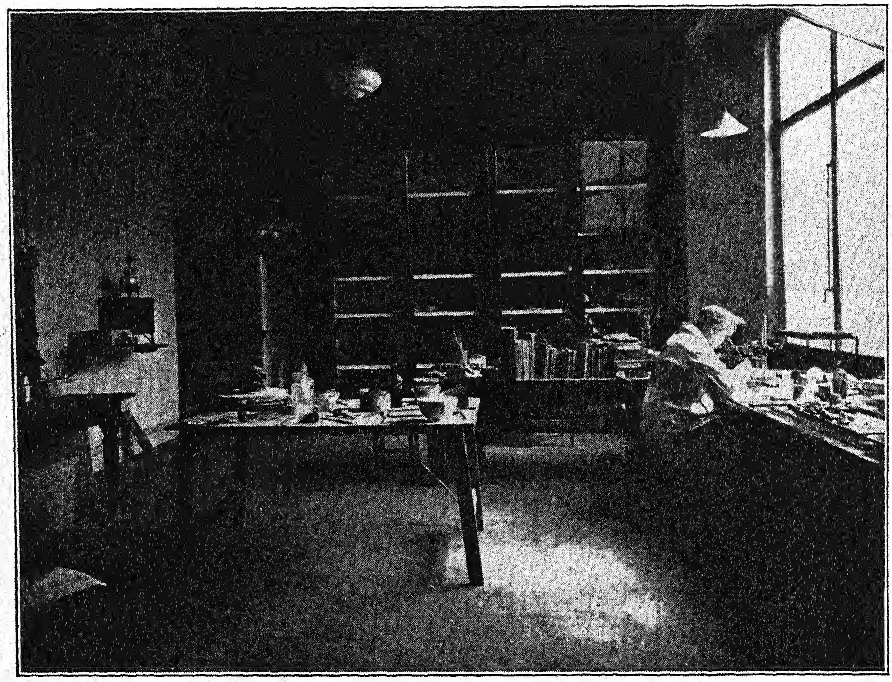


FIG. 2.—DEPARTMENT OF GEOLOGY: PREPARATORS' SHOP (2).

by all workers studying similar or allied forms. In the Department of Geology type-specimens and others which have been described and illustrated in a paper are distinguished by small green disks, and those which have simply been mentioned in some publication bear red disks.

The scientific examination and description of specimens generally takes place in the study of the Assistant Keeper concerned and is conducted on the usual lines (Fig. 3). Lens, binocular, and high-power microscope and micrometer may be used, but in some groups the specimens are so large that they

have to be studied in the workshop and the yard-stick replaces the micrometer.

If after study, description, and registration it be decided to place the specimen on exhibition, various methods may be employed according to the size and tractability of the fossil. The smaller-sized fossils are usually mounted upon white painted or paper-covered ply-wood tablets and are held in position by steel pins. They can thus be removed without difficulty for examination, and the tablet is convenient for the

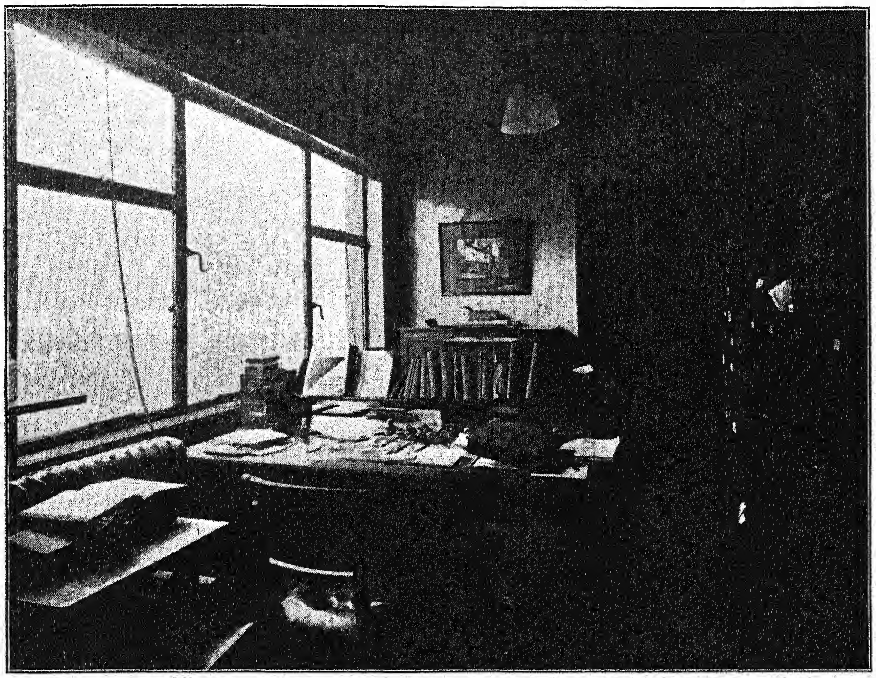


FIG. 3.—DEPARTMENT OF GEOLOGY: AN ASSISTANT KEEPER'S STUDY.

attachment of the printed label bearing the specimen's name and history. Occasionally some forms of shells are mounted in little painted plaster blocks, so moulded that the object rests very securely and naturally, yet quite freely.

The larger fossils must be dealt with very differently, not only on account of their sometimes inconvenient size, but also because of their great weight. Thus, the large individual bones and more or less complete specimens have to be borne upon heavy mahogany base-blocks and supported by a wrought-iron framework, which is made to measure. This mounting work

has been described in an earlier article, but it should be stressed that obviously when the long and careful developmental processes of the workshops are followed by the time necessary for the craftsman to make exhibition safe, a considerable period must often elapse between the specimen's arrival and its public debut. This is very aggravating when the arrival is of great scientific interest and importance and is much heralded in the Press, but the condition of the specimen usually allows of no option.

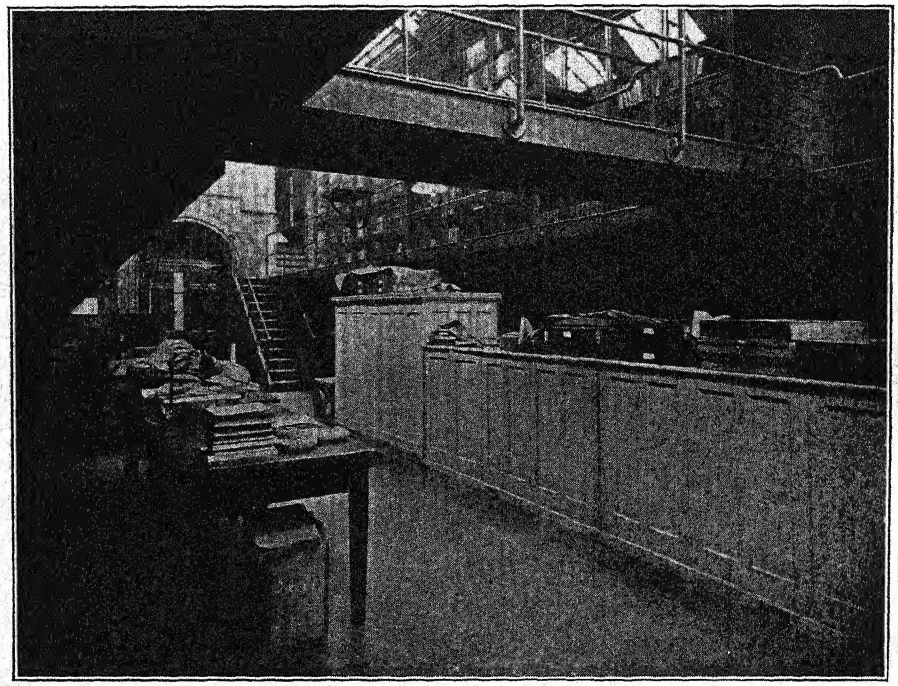


FIG. 4.—DEPARTMENT OF GEOLOGY: "WORKROOM."

When specimens are not placed on exhibition, they must be stored in a position which is not deleterious to the object (for damp, and changes of temperature and humidity can take their toll) and yet is accessible for the inquirer. Many of the geological specimens are stored, therefore, as has been said, in cupboards below the exhibition cases, but in the Basement there are four large storerooms, two of which have mezzanine floors, furnished with wall-cases and centre-cases containing numbered drawers. There are in addition many wall-cases in the corridors throughout the Department and also in the studies of the Staff.

There is no record of the actual number of fossils in the Department and in any case many slabs of stone contain very large numbers of individuals. One of the Museum publications states that, if the drawers containing invertebrate fossils were placed end to end, the line would extend for approximately five miles; but this is a prospect which is unlikely to delight the eyes of either visitors or Staff.

In 1932 the total number of acquisitions was 8138, but this number includes specimens consisting of many associated

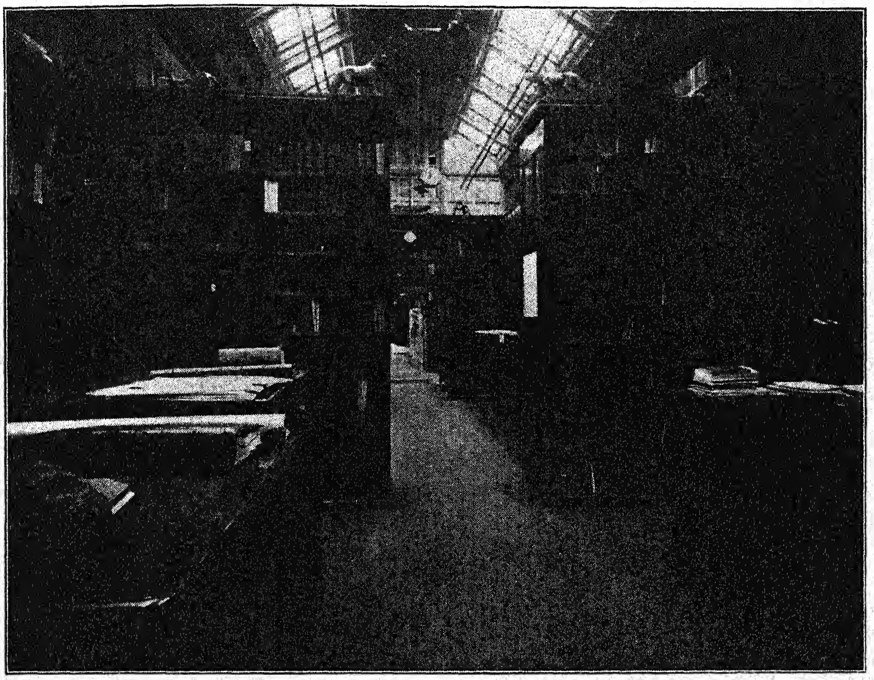


FIG. 5.—DEPARTMENT OF GEOLOGY: LIBRARY.

fossils. Even so, the work done in examining, preparing, mounting, and generally dealing with such material is quite considerable. Every specimen in the Department, whether in store or study or on exhibition, is card-indexed and readily accessible to the inquirer. A small collection of duplicate specimens of the commoner fossils exists, and every year some of these are exchanged with, or presented to, some educational institution. During 1932 nearly 2000 specimens were distributed in this way to 47 educational authorities, while nearly 3000 specimens were sent on loan for examination by 29 specialists.

In addition, in the same year, there were nearly 2000 visits by students to the Department for consultations with the Staff and nearly twice that number of inquiries was dealt with through the post.

A considerable number of specialists from abroad are constantly working in the Department, and much of their work has to be done in the somewhat inadequate space provided by what is called the " Workroom " (Fig. 4).

The Geological Library (Fig. 5) is a particularly good one and contains one of the best specialized collections in the world, comprising more than 20,000 volumes quite apart from numerous pamphlets, separata, etc., and the very extensive map collection. Over 1000 additions are made annually, and this gives some idea of the amount of work that must constantly be done here.

All this work going on day by day in the Department is not for its own purpose alone. Reports are continually being made for other Government Departments, Colonial Surveys, and commercial organizations. Search for coal and oil, for precious gems and metals, are all facilitated by its researches. Of course, most of its work is systematic, a persistent search into the nature of organisms that have lived, a constant amplification of the science of comparative anatomy. To some it may seem that this is merely delving into a mysterious past that is best left buried. But that curious old world with its strange faunas and floras, which indicate unrealizably long periods of time and curious geographical vagaries, is none the less the direct ancestor and the basis of the busy and materialistic world that we occupy to-day.

THE BLUE WHALE SKELETON IN THE WHALE HALL.

By F. C. Fraser, B.Sc., Assistant Keeper, Department of Zoology.

The first exhibit to be placed in its permanent position in the new Whale Hall is the skeleton of a large Blue Whale, *Balænoptera musculus* (or *B. sibbaldii*). Not only is this the largest specimen that will be shown in this gallery, but it is also almost certainly the largest articulated skeleton in any Museum in the world. The only exception to this statement may possibly be in the Museum at Buitenzorg, Java, where there is a skeleton of a whale 27·8 metres in length, but I do not know whether it is articulated.

The animal, of which the skeleton has just been mounted, became stranded on a sandbank in Wexford Bay on March 25, 1891, and on the following day, when its struggles to free itself had sufficiently diminished, it was killed by having a long knife thrust into its body under one of the flippers. The carcase was seized by the Receiver of Wreck as a "Fish Royal," and was sold by auction for £111.

The whale was believed to be a female, and the dimensions reported to G. H. Barrett-Hamilton and recorded by him in the *Zoologist* (1891, vol. xlix, p. 307) are as follows:—total length about 82 feet, length of flippers $10\frac{1}{2}$ feet, width of flippers $2\frac{1}{2}$ feet. The dorsal fin was 11 inches high and 28 inches long. The tail measured 16 feet across its outer edge. The blubber was rather tough and not very rich; it was from 10 to 4 inches thick on the back. The entire skeleton was purchased for the British Museum (Natural History) and was prepared under the supervision of E. Gerrard, of Messrs. E. Gerrard & Sons, London.

It remained in store in the Osteological Room for 42 years for lack of space in which to exhibit it, and it was only towards the end of last year that the bones were taken out and articulated by the same firm of naturalists, which so many years previously had cleaned the skeleton and brought it to London.

The work of articulating a large cetacean skeleton is not easy and the technique adopted is necessarily different from that used when dealing with smaller vertebrates. The bones cannot be placed on a work-bench and conveniently arranged by one person; on the contrary, it requires two men to move one vertebra and the help of many more with blocks, tackle, and scaffolding to manœuvre into position the skull and lower jaws, the weights of which are reckoned in tons. The correct curvature of the backbone must be judged beforehand and expressed in a stout iron bar on to which the vertebræ are threaded. The bones themselves present another problem because of their friability. In the living animal the skeleton contains a great amount of oil, but, when this is extracted it leaves the bone, with the exception of the thin layer of compact substance on the outside, in a very soft spongy condition. With such difficulties as these and many others the firm's men had to contend, and the degree to which they were successful in overcoming them may be judged from the excellence of the finished work.

The skeleton is that of an animal which had not grown to full length. Most of the vertebral epiphyses have no bony connexion with the centra, and the same condition is seen in the limb bones.

As the Blue Whale is from 24 to 28 feet long at birth, and from 72 to 76 feet by the time it is two years old, the Wexford specimen was probably not more than four or five years old when it was killed.

NOTE ON THE METHOD OF SUSPENSION.

By G. F. Herbert Smith, M.A., D.Sc., Secretary.

The specimen was articulated on the floor of the Hall slightly eastwards of its permanent position, and, when taken over from the naturalists who had mounted it, it rested on a set of temporary struts of wood (Fig. 1). The new building* for the exhibition of whales had been specially designed for carrying heavy specimens slung from the roof, and for that reason its steel ribs are

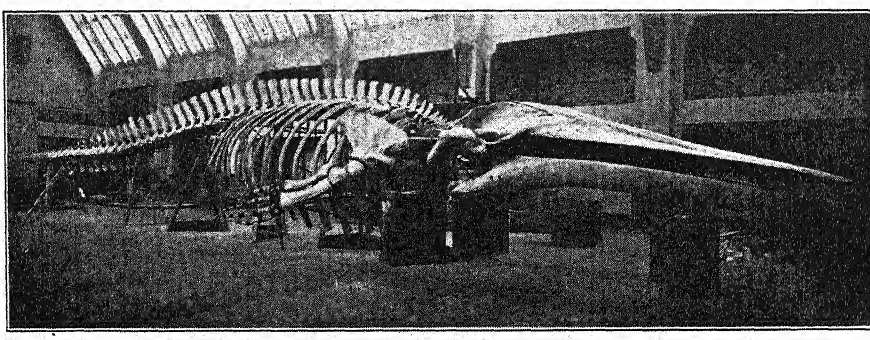


Fig. 1.—Blue Whale skeleton resting on floor.

exceptionally strong, and the ceiling has been pierced at convenient intervals with metal tubes to allow of the necessary connexions being made with the supporting members above. The permanent position of the specimen was 20 feet (6 m.) above its temporary one. Five stout rings had been bolted to the iron core of the skeleton to provide the points of suspension : two in the head and three in the body and tail.

Mr. W. Sanders, the General Foreman, discussed with the writer what would be the safest and most effective way of carrying this large specimen. Its weight is considerable; it cannot be less than ten tons and may be nearly twelve, and much of it is concentrated in the head, so that the strain on the first two rings is far greater than on the rest. It was thought, therefore, to be wise to arrange that the suspending material should safely carry as much as five tons. The steel cables selected, which have a circumference of 2 inches (5 cm.), are guaranteed each to have a breaking strain of at least fifteen tons, so that, as there is a pair of cables at each point of suspension, there is an ample margin of safety of more than five times the maximum load. Cables have the advantage over chains that in ordinary wear the constituent strands part singly and ample warning is given before their condition becomes dangerous.

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* John H. Markham, F.R.I.B.A., The New Whale Gallery, *Natural History Magazine*, 1932, vol. iii, pp. 184–188.

Careful determination was made of the lengths required for the several pairs of cables, and, fitted with eye-rings and spliced, they were supplied to these lengths.

Above the ceiling each pair of cables is attached by iron straps to opposite ends of rolled steel joists, measuring $4\frac{1}{2}$ by 5 inches (11·4 by 12·7 cm.) in section and 7 feet (2·1 m.) in length, which rest on the longitudinal concreted girders, 4 feet (1·2 m.) apart, of the building and are held in position by wooden cleats. Pieces of wood of suitable thickness give a satisfactory bed to the joists. Wedges are used to give slight adjustment to the lengths of the cables where necessary. The first ring, at the end of the head, is slightly out of the central vertical plane and some adjustment to the supporting cables had to be made. Teak wedges were driven into the lower ends of the ceiling perforations so as to steady the

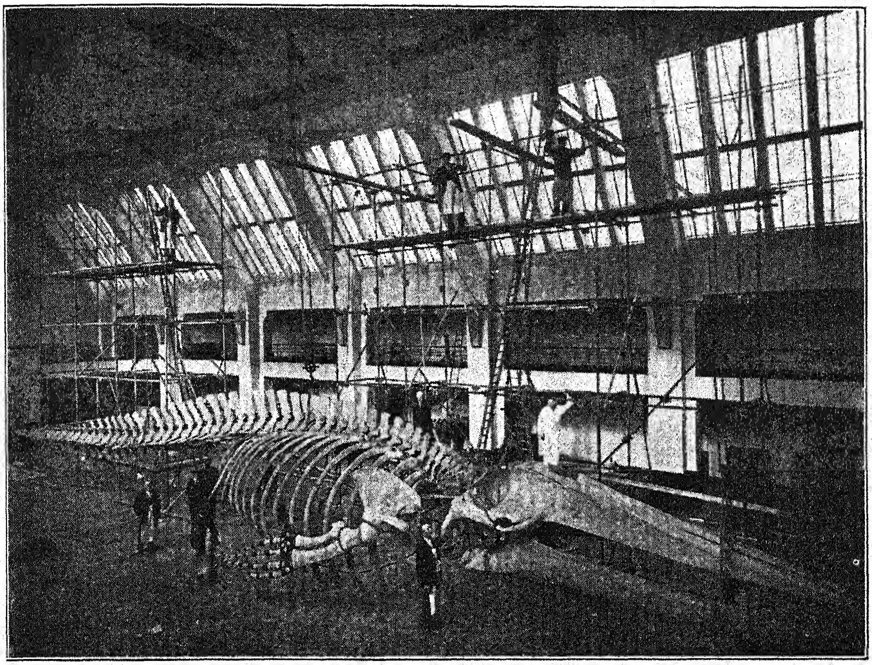

FIG. 2.—BLUE WHALE SKELETON SUPPORTED BY LIFTING GEAR.

cables and increase the curvature at the bend. The cables are attached to the rings on the specimen by means of D-shaped shackles, of one-inch diameter steel and each capable of carrying a load of six tons. The cables were coated with aluminium paint before being placed in position. It will be noted that as the perforations, through which the cables pass, are close to the main ribs of the building, no excessive strain is thrown upon the longitudinal girders.

The difficult task of hoisting the heavy specimen to its permanent position was undertaken by the General Foreman and picked members of the Works Staff. Hoisting gear, corresponding to each point of suspension, was attached by wire ropes passing through perforations on the other side of the contiguous main rib to suitable parts of the structure above the ceiling. The hook of each gear picked up a sling passed round the skeleton at the proper distance from the corresponding ring. A difficulty was encountered at the second point because,

owing to the great weight here and the consequent crushing tendency of the sling, it was found necessary to place it round the neck, which was a point some way from the hoisting gear. Consequently, when the specimen had nearly reached the requisite position the pull on the gear was so out of the vertical that its chain turned over and jammed and it was necessary to transfer the weight temporarily to the cables to enable the gear to be freed; this none too easy task at that height from the floor was undertaken by the General Foreman.

To enable the ends of the cables and the operating chains of the gears to be reached, two sections of tubular scaffolding were erected. On February 22 the weight of the skeleton was transferred from the floor supports to the lifting gear (Fig. 2). It remained on, but clear of, the supports all night in order to assure that there was no yield anywhere. The following morning (February 23)

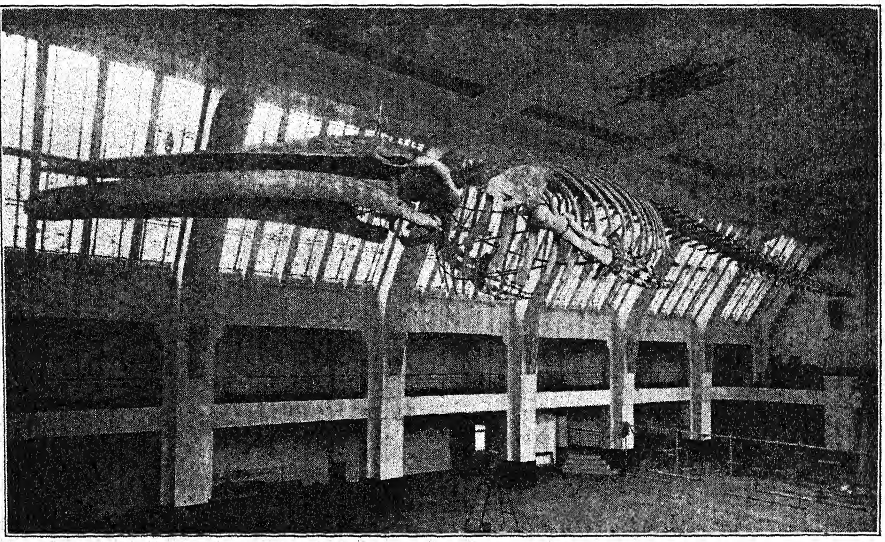

Fig. 3.—Blue Whale skeleton slung from the roof.

all was found in order, and in the course of the day the skeleton was raised and attached to the cables without accident and without incident except for the jamming of the large gear, to which reference has already been made, and more slightly of a small gear, at No. 3 point, which was freed with little trouble. Fig. 3 shows the skeleton in its permanent position.

BOOK NOTICES.

Exploring the Animal World. By Charles Elton. Woodcuts by Nora S. Unwin. Pp. 119 with 2 whole-page figures. (London: George Allen and Unwin, Ltd. 1933. 3*s.* 6*d.*)

Books of popular natural history tend to a somewhat dreary monotony of mediocrity. Not many of them, perhaps, are very bad; few of them, certainly, deserve to be called very good. This little book, based on a series of broadcast lectures given in the spring of 1933, seems to the reviewer to come into the latter category. In an easy and informal style well suited to hold the

attention of wireless listeners and no less that of readers, the author sketches the modern ecological outlook on the animal world, taking his illustrations from the familiar birds and beasts of the English countryside. His appeal for observers to help in the survey of the animal population should win many recruits from members of local natural history societies and other associations of lovers of the open air. W. T. CALMAN.

The Birds of Tropical West Africa. By D. A. BANNERMAN, M.B.E., M.A., F.R.S.E. Vol. III, pp. xxxv + 487, 12 coloured plates and map; text illust. (London: The Crown Agents for the Colonies. 1933. 22*s.* 6*d.*)

THE first two volumes of this work have already been noticed in this Magazine (April, 1931; April, 1932). The third volume now published carries the systematic account up to the end of the Piciformes, leaving only the great Order Passeriformes to be dealt with in subsequent volumes. The mass of material to be included was so vast that some compression of the less essential parts of the synonymy was necessary, and in spite of this the volume is larger than the second one by some sixty pages.

The praise which was given to the text and figures of the earlier volumes leaves little to be added in respect of this volume, except that Mr. Bannerman's constantly extending list of correspondents in West Africa makes the observational material at his disposal more and more complete and detailed as the work progresses. The notes on the habits and distribution of the various species form a mine of ecological information which will serve as a basis for future work in many directions. Already it is understood that Forest Officers and others in the various colonies whose business it is to draw up lists of useful and harmful birds deserving or undeserving of protection are relying on "Bannerman" for their information.

Mr. Bannerman in his preface explains that the financial situation has prevented the carrying out of plans for some collecting expeditions. We understand, however, that since this was written it has been found possible to provide a small sum towards an expedition by Mr. Willoughby Lowe to Ashanti, from which valuable results are expected.

In such a work as this the compiling of the lists of synonyms and references to previous authors is a most time-wasting and dreary task; and yet, if it is not carried out with painstaking accuracy, the value of the book to future students is enormously diminished. We are glad to see, therefore, Mr. Bannerman's tribute to his volunteer assistant, Mrs. E. D. Atkins, who has relieved him of much of the drudgery in such matters as the taking and recording of measurements, and who "is alone responsible for the synonymy." Many of us have at times wished that we had the services of so competent an assistant. W. T. CALMAN.

Insects, Man's Chief Competitors. By W. P. FLINT and C. L. METCALF. Pp. viii + 133, text illust. (Baltimore: The Williams and Wilkins Company. 1932. 5*s.* 6*d.*)

"THIS little book is intended to set forth some of the important facts concerning insects and some of the interesting things about their lives." It is a good little book and pleasing to read. The emphasis throughout is rather strongly in the direction of the applied science, as is not unnatural, since this branch of entomology offers so much that can be quickly adapted to startle the lay mind. Having suitably used this ammunition in the first few chapters, and so created a proper spirit of inquiry in the reader, the authors then perform with considerable skill the difficult task of passing in review the whole of the insect world in such a way as to make the main lines of classification intelligible.

Generalisations concerning such a varied host lead them into one or two unguarded statements such as (p. 56) "the favourite food [of Diptera] seems to be the blood of animals," but on the whole the picture presented is faithful if rather bold in outline and lacking in detail, as indeed it must be with so little available paper. The remaining eight short chapters deal with "insect biographies," presenting brief stories of the life of eight celebrated species, such as the grape *Phylloxera*, the plague flea, the ox warble, etc. The treatment of these, as of the whole subject, is to the point, nowhere heavy, and leavened with a mild spirit of light humour. N. D. RILEY.

Genealogy of Love. By CURT THESING, M.D. Translated by EDEN and CEDAR PAUL. Pp. x + 283, with 73 figures. (London: George Routledge & Sons, Ltd. 1933. 15*s.*)

THIS volume has much to recommend it in spite of its title, which is unfortunate. For a book that obviously deals with the subject matter in a scientific and serious vein, a more suitable title could surely have been selected.

The opening chapters deal with reproduction in its simplest form, taking as examples *Amoeba* and *Paramaecium*; the reproduction of both of these genera is dealt with in some detail and illustrated with figures. Then follows a chapter on hermaphrodites and intermediate stages, and another one on the amatory life of hermaphrodite animals. This latter section is well illustrated with good photographs of snails and earth-worms, but it is a little unfortunate that photographs of adders should have been included in this section. The illustrations in the next chapter include some photographs of mantises, one showing the fate of the male after accomplishing its natural function. The marked sexual difference in size of these animals would appear to give the male but little chance in this uneven combat, and among mantises, at any rate, the stronger sex is the weaker one.

Chapters on the emancipation of woman, lures and stimuli, and love in human beings conclude the work. GUY DOLLMAN.

Creation's Doom. By DESIDERIUS PAPP. Translated by H. J. STENNING. Pp. 286, with 8 plates and 17 text-figures. (London: Jarrolds. 1934. 12*s.* 6*d.*)

THE title of the book is perhaps misleading: according to the preface it purports to tell of the future of mankind and of the fate in store for our earth in the millions of years to come; but it includes the past as well as the future, and discusses the origin of the earth and the life upon it. The title of the original book, presumably in German, of which this is a translation, is not stated.

The style in which the book is written is typified by the frontispiece illustration, the caption of which is: "A weird vision: a giant reptile from the Chalk Age appears in a modern city." The city, it may be remarked, is evidently intended to be transatlantic. Indeed, the absorbing interest of the theme is marred by its sensational treatment. Unlike many writers on the subject, the author does not picture humanity decaying and finally perishing of cold owing to the lack of heat from a waning sun, but coming to an abrupt end while in the plenitude of intellectual capacity, though hardly of aesthetic beauty, owing to the loss of reproductive power. He then speculates about what is likely to replace humanity as the dominant rulers of the world. In the final chapter, the world, on which life is by now completely extinct, shares the cataclysm of the solar system as it plunges into a dark gaseous cloud.

The illustrations are at least a credit to the artist's imagination. There is perhaps reason to doubt whether the city of the future will be a mass of skyscrapers; present-day thought favours the development of satellite towns.

G. F. HERBERT SMITH.

Plants and Human Economics. By Ronald Good. Pp. xii + 202, with 8 maps. (Cambridge: University Press, 1933. 5*s*.)

The preface to this book begins with a paragraph about education and the examination system, and proceeds: "The examination system is with us and from it we cannot as yet escape. Meanwhile we must exploit its good points and do what we can to remedy its defects. This little book is a small attempt to do something in the latter way for a particular subject—botany."

This being the author's outlook it must be taken into account. However, it appears to signify merely that he believes that more attention should be paid to economic botany. In this opinion many will agree, for in the fashions of the schools it seems never to have had a place. The "Treasury of Botany" is the main mine from which botanists obtain their facts about the older aspects of the subject, but information about modern developments can be obtained only from literature not readily available to students.

In that it is an attempt to remedy this defect the present book is to be welcomed. The first fifty pages or so deal with general matters, as, for example, the life of the green plant, and science and agriculture. The various plant products are then treated, these being grouped as far as possible; there is a final chapter on "The economic botany of Great Britain." An appendix which also serves as an index gives a useful list of genera and species under their families with their common names or those of their products; this, however, is not the sort of index likely to enable the beginner to find what he wants. There is also a general index and eight maps.

The book is a mass of information, but as a whole it will not prove easy reading for those for whom it is written. Some pages are little more than lists of names and it would have been better to have given these in an appendix. There are many aspects of economic botany that can be writ large, and full advantage has not been taken of this. More of the exploration and adventure associated with the discovery and introduction of some of the plant products and less of the dictionary would make a better appeal to those who have to be educated. Perhaps the author might attempt such a book for the general reader.

Six of the maps have the crops printed on them in red, but on such a small scale can give only a very rough idea of distribution. The remaining map gives a generalized idea of the world arrangement of deserts, grasslands, and forests, and of coal- and oil-fields. J. Ramsbottom.

MUSEUM NEWS.

The series of special lectures on Monday mornings will be in abeyance during the summer months and resumed in the autumn. There is no tour by the Guide Lecturer on Monday mornings.

Since the beginning of February, talks, of a more general nature than the Monday morning lectures, have been given on Sunday afternoons at 3 and 4.30 either in the public galleries or in the Board Room.

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The new Whale Hall was temporarily opened to the public from March 1 to April 8 to enable them to see the large Blue Whale skeleton, which had recently been placed in position there (p. 228), being suspended by cables from the roof. It is intended to sling, on either side of it but at a lower level, two large skeletons removed from the old iron building (see this vol., p. 194), and the work of articulating them will be begun as soon as the Hall is closed.

* * * * * * * *

A SMALL exhibit has been placed in the Central Hall, illustrating the invasion of German rivers by the Chinese Mitten Crab (*Eriocheir sinensis*). Specimens of the crab from China and from Germany are shown side by side, and maps give its distribution in eastern Asia and in Europe.

* * * * * * * *

AN exhibit of the eggs of the Emperor Penguin has been placed in the Penguin Bay of the Bird Gallery. Apropos of the recent publication of Mr. G. Seaver's book "Edward Wilson of the Antarctic," which has recalled the hazardous journey made by Dr. Wilson and two other members of Scott's last expedition in the Antarctic winter of 1911 to obtain eggs and embryos of the Emperor Penguin, the opportunity has been taken to exhibit the three eggs then collected together with several water-colour drawings by Dr. Wilson.

* * * * * * * *

THE Trustees have appointed Mr. A. G. Gabriel Higher Grade Technical Assistant in the Department of Entomology, and promoted Mr. G. W. C. Holt, Mr. L. E. Carey, and Mr. W. L. Law to Second Class Technical Assistantships in the Departments of Zoology, Entomology, and Botany respectively.

Mr. Gabriel first joined the Staff on November 7, 1898, as a Boy Attendant in what was then the Insect Section of the Department of Zoology and is now the Department of Entomology. During the whole of his service he has assisted the member of the Scientific Staff in charge of the Collection of Butterflies.

* * * * * * * *

THE Trustees propose to make in the autumn three appointments to Assistant Keeperships (Second Class) in one or more of the Departments of Zoology, Entomology, and Botany, according to the suitability of the candidates. Full information may be obtained on application to the Director.

The Trustees will also shortly appoint five Attendants.

OBITUARY.

FRANCIS ARTHUR BATHER.

(1863–1934)

DR. F. A. BATHER, F.R.S., died on March 20 at his residence at Wimbledon after an illness of only two days. An account of his career, with a portrait, appeared in this Magazine (April 1928, Vol. I, pp. 223–224) upon his retirement from the Keepership of Geology on February 17, 1928.

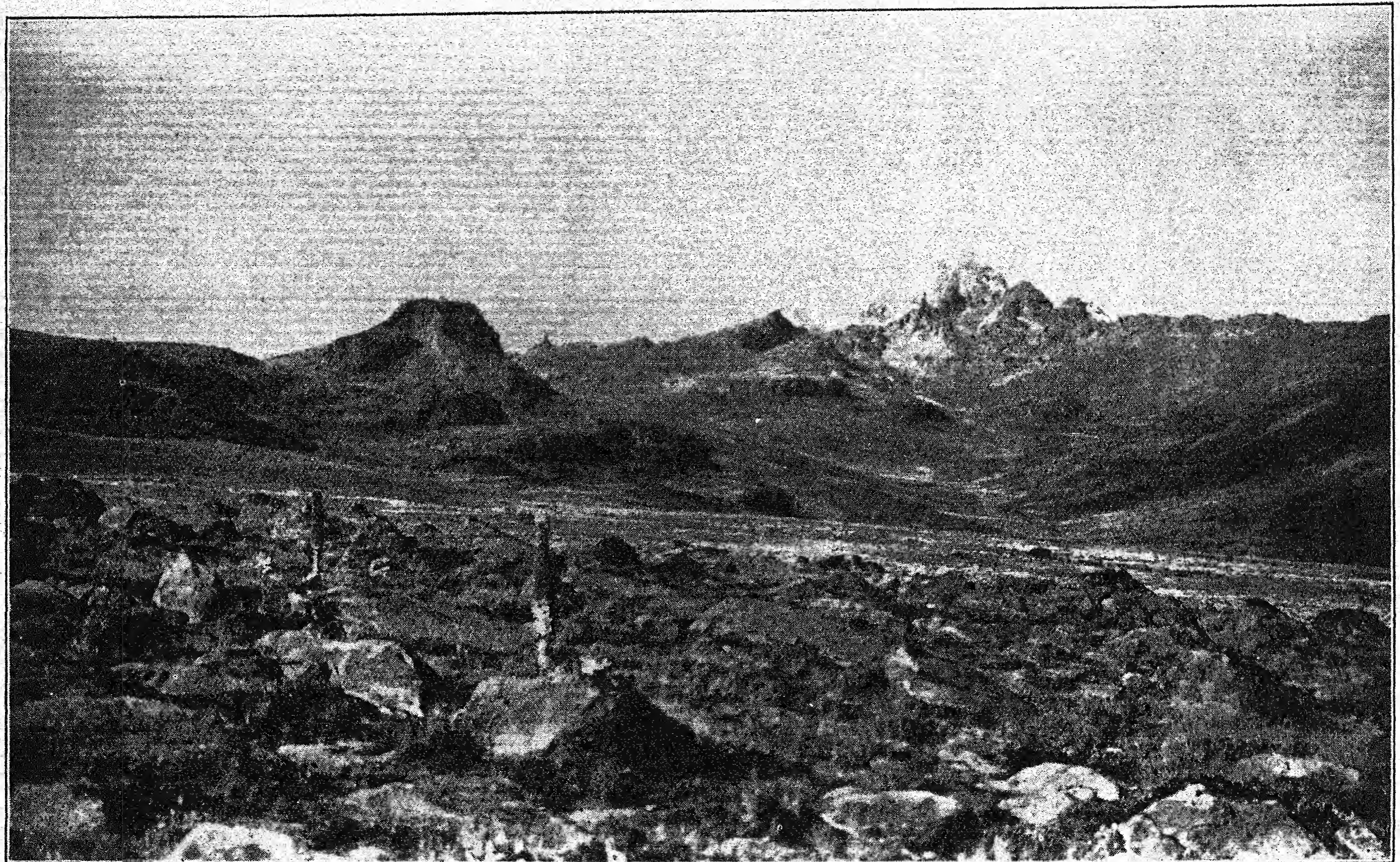
Dr. Bather's connexion with the Museum by no means ended with his official retirement. A study was placed at his disposal on the north side of the building and he continued to attend with almost the same regularity as before right up to his last illness. Neither did he relax his activity outside the Museum. He retained his keen interest in the affairs of the Museums Association and edited the *Museums Journal* until about a year ago; a letter from his pen appears, indeed, in the current number of the *Journal*.

The large attendance at the funeral service at Golders Green Crematorium on March 22 included many from the Museum. The whole of the staff of the Department of Geology that could be spared from duty was present, as well as many of the staff outside the Department; Sir Henry Miers, F.R.S., represented the Trustees of the British Museum.

Copyright Photograph by C. Gilbert Rogers.

SCENERY IN UGANDA.

Flowering heads of Egyptian Papyrus (*Papyrus antiquorum*), growing alongside a small channel, which traverses a wide swamp and passes under the causeway carrying the motor road from Kampala to Masaka at the north end of the Victoria Nyanza



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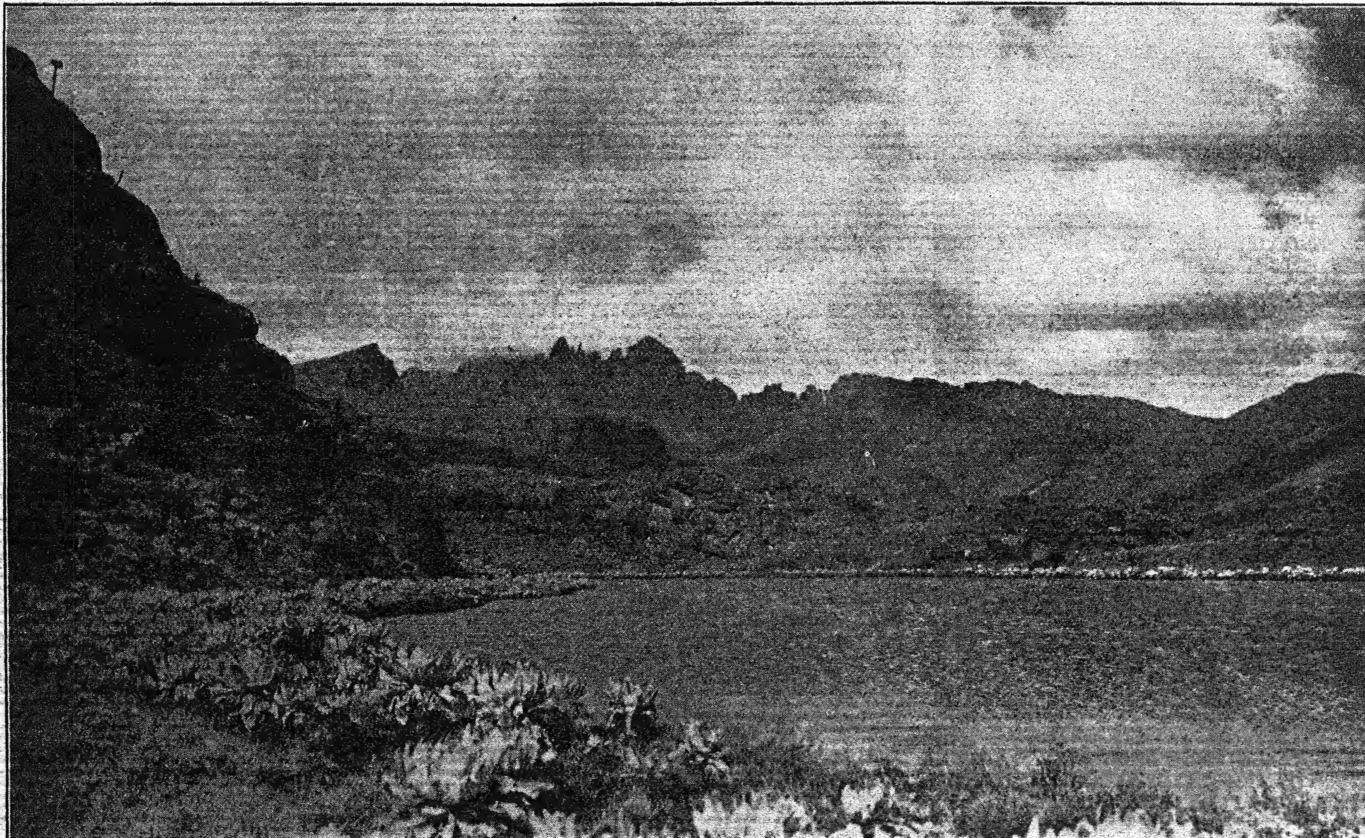
SCENERY IN KENYA COLONY.

North-west slopes of Mount Kenya: one of the sources of the Sirimon stream in the northern slopes of Sen Deyo range (elevation 12,500 feet). The gentle slopes of the valley are broken here and there by extensive vertical cliffs of trap, which form a conspicuous feature of the landscape. In the foreground are last year's flowering spikes of *Lobelia keniensis*.



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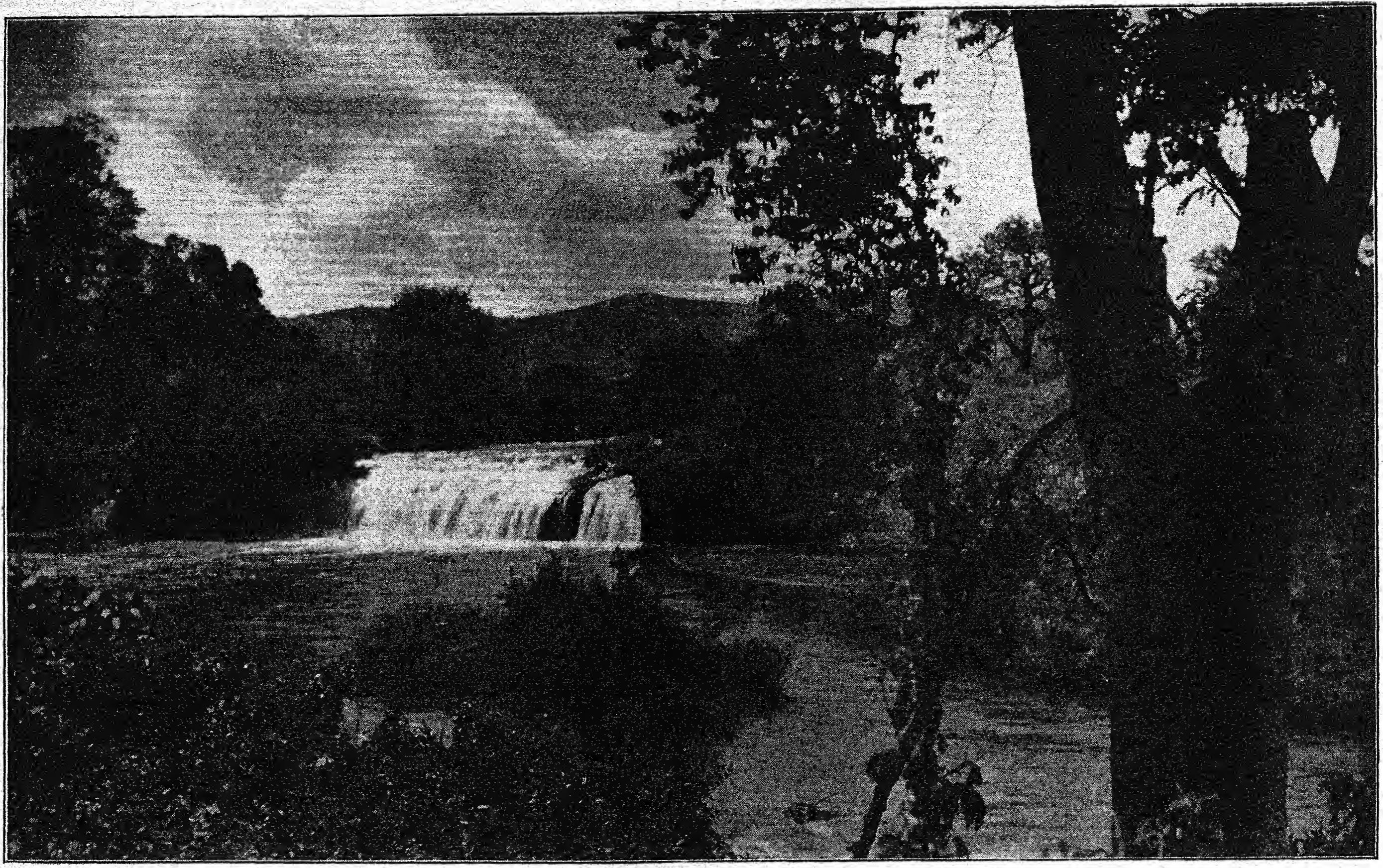
SCENERY IN KENYA COLONY.

Small lake among the cliffs seen in the right middle distance of Plate xlii (elevation 13,000 feet). The lake, which is visible only from the top of the high ridge forming the western waterparting of the Sirimon stream, is only a few feet deep, with a perfectly flat bottom, and is destitute of vegetation. No water flows into or out of it, and its edge is everywhere undercut by wave action. Sen Deyo range is on the sky-line; in the foreground are plants of *Senecio brassica*.



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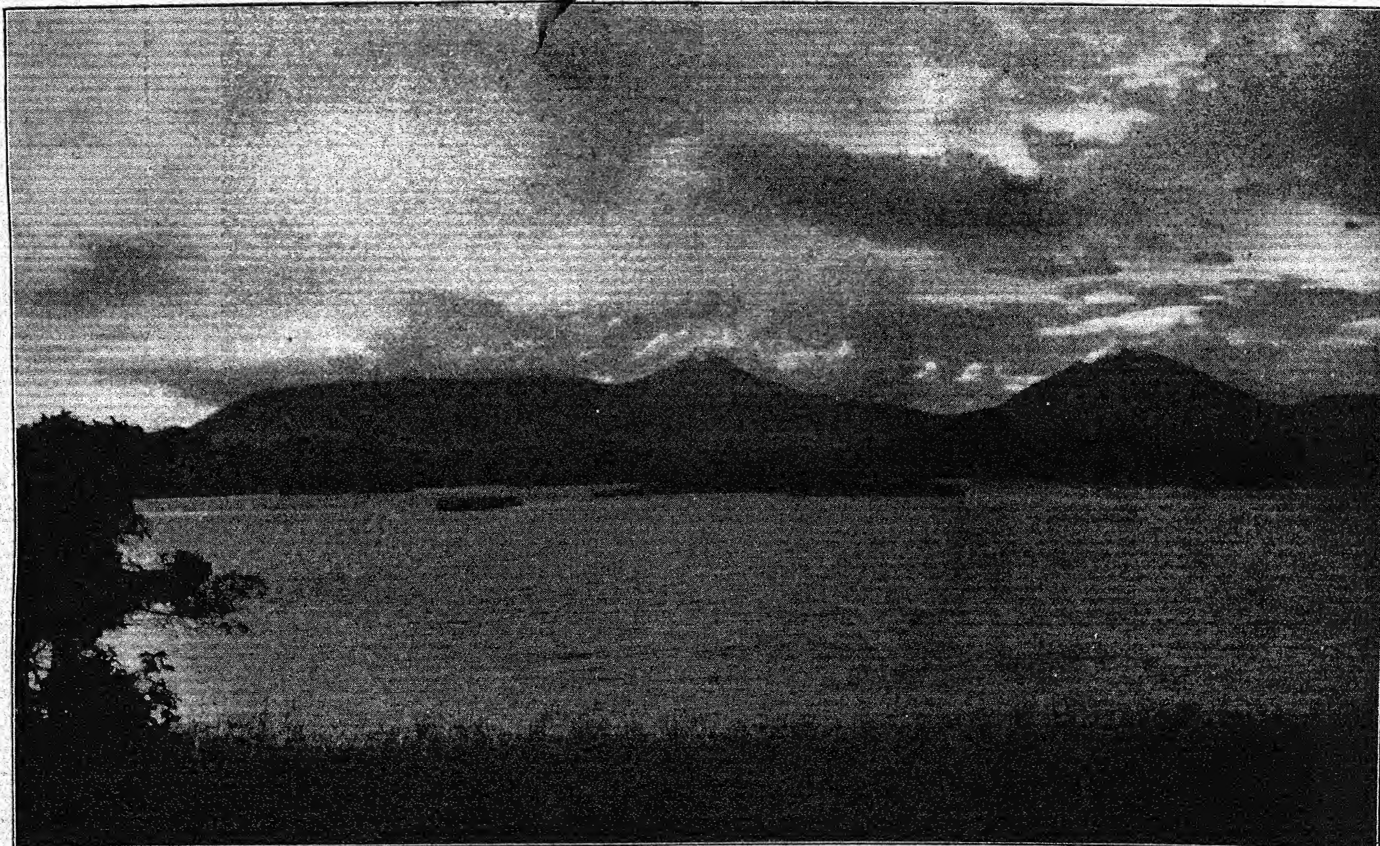
SCENERY IN KENYA COLONY.

Triple waterfall on the Tana river, about a mile up-stream from the suspension bridge on the motor road between Fort Hall and Nyeri, close to Sagana railway station (elevation 4070 feet). The hills beyond, ranging up to 7000 feet, are in the Kikuyu native reserve.



SCENERY IN UGANDA.

South-west corner of Kigezi civil district of Uganda, looking south from near the north end of Lake Mutanda (elevation 6150 feet), which drains into the Congo. The boundary between Uganda and the Belgian Congo passes over the three mountains on the sky line: Mahavaru (13,493 feet) with its usual cloud cap, M'gahinga (11,440 feet), and Sabinio (11,960 feet).

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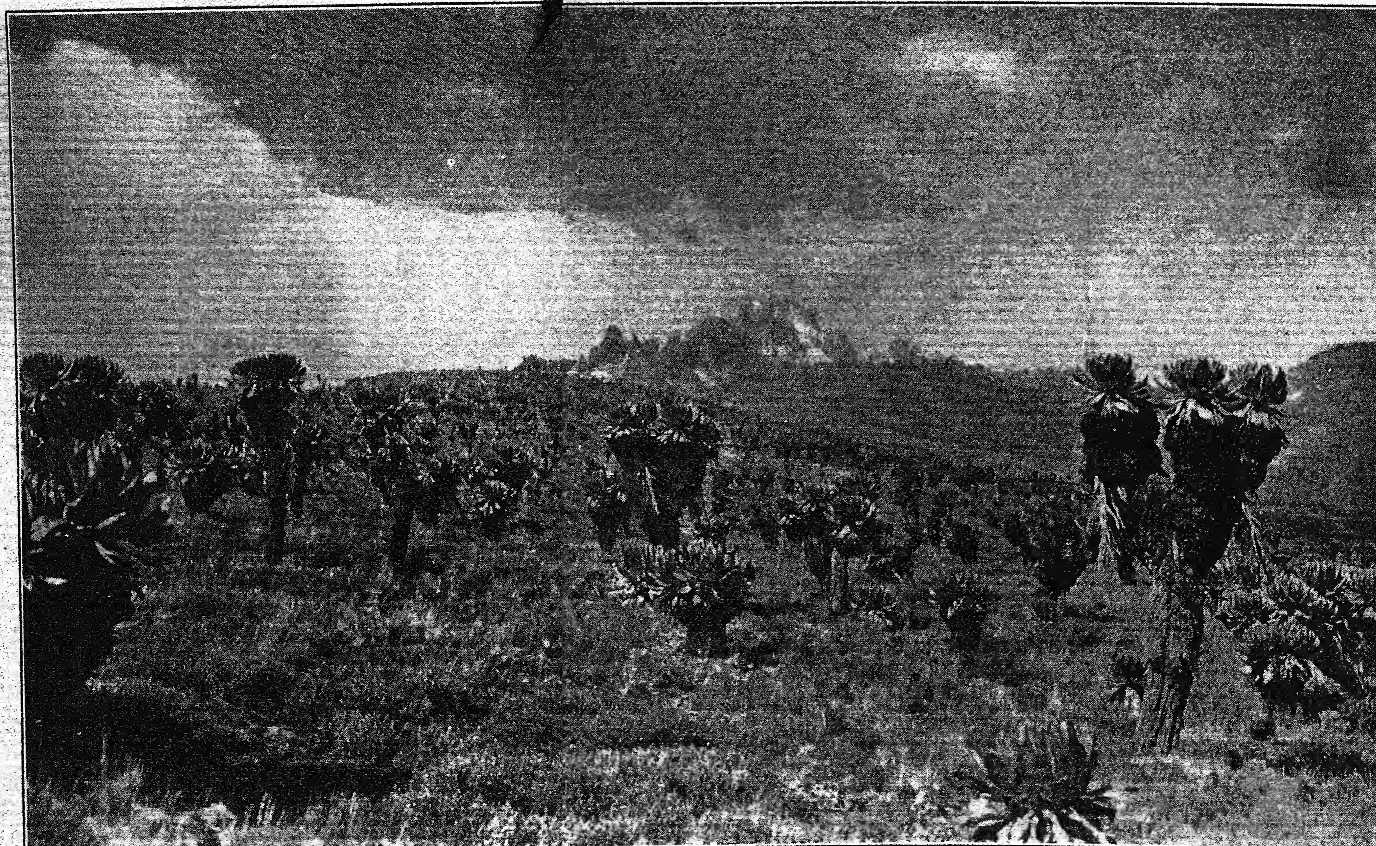
SCENERY IN KENYA COLONY.

Well-grown wild Olive tree (*Olea europæa*), about 35 feet high, lit by the evening sun in a settler's garden, about 11 miles west of south from Nairobi, in a dry district.



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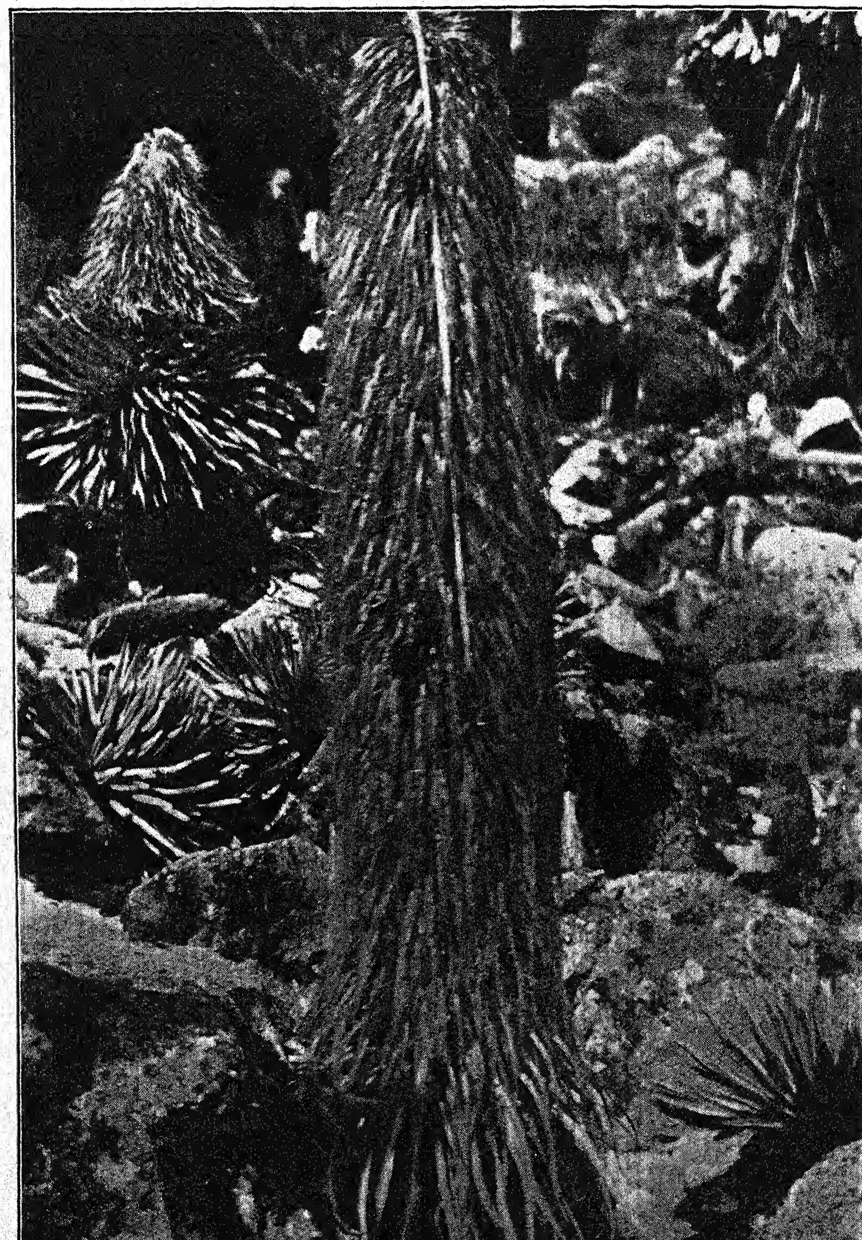
SCENERY IN KENYA COLONY.

Typical open forest of *Senecio keniodendron* in the upper part of Sirimon valley (elevation 13,500 feet), on the north-west slopes of Mount Kenya. It is the only woody species at this elevation. The trees, which are stunted owing to their exposed position, are from 6 to 15 feet high. The leaves, which persist for years below the crown of living ones, form a characteristic feature of this species. It flowers at long intervals; dead flowering spikes, about 6 feet long, may be seen projecting beyond the leaves. Sen Deyo range and top of Mount Kenya are in the distance.



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SCENERY IN KENYA COLONY.

Half-grown flowering spike of *Lobelia Telekii* among fallen rocks at the base of a basalt mass in the upper portion of the Sirimon valley (elevation 12,700 feet), on the north-west slopes of Mount Kenya. This species in the shelter of a vertical mass of rock and in the open is markedly different in growth. The tallest spike found was over 11 feet high, and

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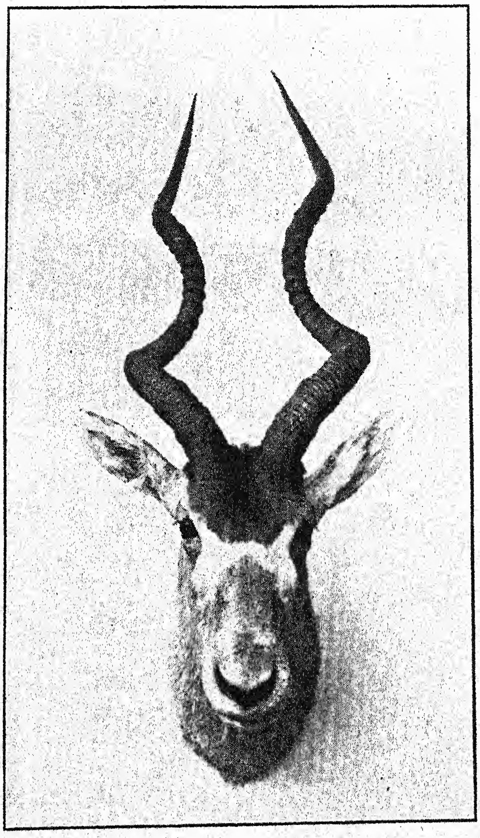
A FEMALE ADDAX HEAD.

By GUY DOLLMAN, B.A., Assistant Keeper, Department of Zoology.

THE Museum has recently received as a donation from the Rowland Ward Trustees the mounted head of a female Addax (*Addax nasomaculatus*), which has been placed amongst the exhibition series in the West Corridor, Central Hall.

The female Addax, like all the members of the sub-family Oryginae, carries horns, which are nearly as long in the female sex as in the male, but rather more slender. The genus *Addax* is characterized by the long, spirally-twisted horns, which at first sight are reminiscent of those of the Lesser Kudu. The horns are, however, closely ridged throughout the greater part of their length; the form of the horns may be described as a heteronymous, cork-screw-like spiral. Another generic character of interest is the broad and shallow hoofs, elongated posteriorly and broad in front; this is probably a special adaptation, as with the reindeer, for travelling over soft ground. In height the animal stands about 38 to 42 inches at the shoulder,



FEMALE ADDAX HEAD.

and the weight of an adult bull has been given as about 250 lb. The longest horns on record are a pair measuring $39\frac{5}{16}$ inches in length; this pair belonged to a male, and the next longest pair on record, which measure $39\frac{1}{8}$ inches, belonged to a female. The general colour in summer is sandy above and whitish on the rump, underparts, and limbs, with a brown patch on the forehead, and with well-marked white eye-tufts, reminiscent of the white eye-tufts found in the Roan and Sable antelopes. In winter the tint becomes greyer and the hair longer, a heavy growth of long brown hair being developed on the neck, shoulders, and forehead.

The Addax is found in the desert districts of northern Africa, including southern Tunisia, Algeria, a great part of the Sahara, and Egyptian Sudan. In the Sudan the range extends through Dongola, Darfur, and Kordofan Province, its most southern limit being about 15° 7′ latitude N. The present specimen was shot at Wadi Hawa, Darfur, and therefore represents the Sudanese race of Addax which has been named *Addax nasomaculatus addax*, the typical or Tunisian race being known by the name *A. nasomaculatus*. The Sudanese form does not acquire the thick winter coat which is found in the animal inhabiting Tunisia and Algeria.

The Addax was in former days a much commoner animal than it is to-day, and, judging from the Roman mosaics and frescoes found in north Africa, it enjoyed a fairly extensive distribution. It is hunted by the Arabs with their long-haired greyhound-like dogs, or Slughis, but is rarely shot by Europeans owing to its inaccessible habitat. The spoor of the Addax is rather similar to that of the Ox; its broad feet would appear to help it in getting about over deep sand just in the same manner as the feet of a reindeer assist the animal in travelling over snowfields.

THE AUSTRALIAN MUSEUM.

By C. Anderson, M.A., D.Sc., C.M.Z.S., Director.

I. Historical.

Apart from the Museum belonging to the first Philosophical Society of Australasia (1821–22), which was apparently never opened to the public, the first Australian Museum was established in Sydney about the year 1827. In a dispatch from the Colonial

Office, dated 30th April of that year, Earl Bathurst stated that he was disposed to allow a sum not exceeding £200 per annum to assist in the establishment of a "Publick Museum at New South Wales," and that he had been further induced to consent to the appointment of a young man to assist in collecting and arranging the specimens.

The young man referred to was William Holmes, who was styled Colonial Zoologist and who was the first custodian of the "Colonial Museum," the original designation of the institution which ultimately became the Australian Museum. It is not known with certainty when Holmes took over his duties, but in 1830 he was in charge of a collection, for in the *Sydney Gazette* of 31st August of that year we find the following passage:

> The public are not generally aware that a beautiful collection of Australian curiosities, the property of Government, is deposited in the old Post Office. The Museum is under the superintendence of Mr. Holmes, who, between the hours of ten and three, politely shows the same to any respectable individuals who may think fit to call.

This extract shows that Mr. Holmes possessed two of the most valuable attributes of a Museum Curator, namely, urbanity and discrimination, but he did not long hold the position of Colonial Zoologist, for apparently he died in 1830.

The collections had many vicissitudes and for several years had no permanent home, being housed successively in various official and semi-official buildings where room happened to be available. In 1834 the infant Museum was contained in a room attached to the Legislative Council building and was in charge of the Messenger, William Galvin, assisted by a convict, John Roach, the latter an enthusiastic ornithologist, who had added greatly to the collection, so that in 1834 the Clerk of the Council reported to the Colonial Secretary that the collection had increased so much that it should be styled the Australian Museum and placed under Trustees. In the Estimates of Expenditure for 1835 (dated 12th June, 1834) appears the entry:

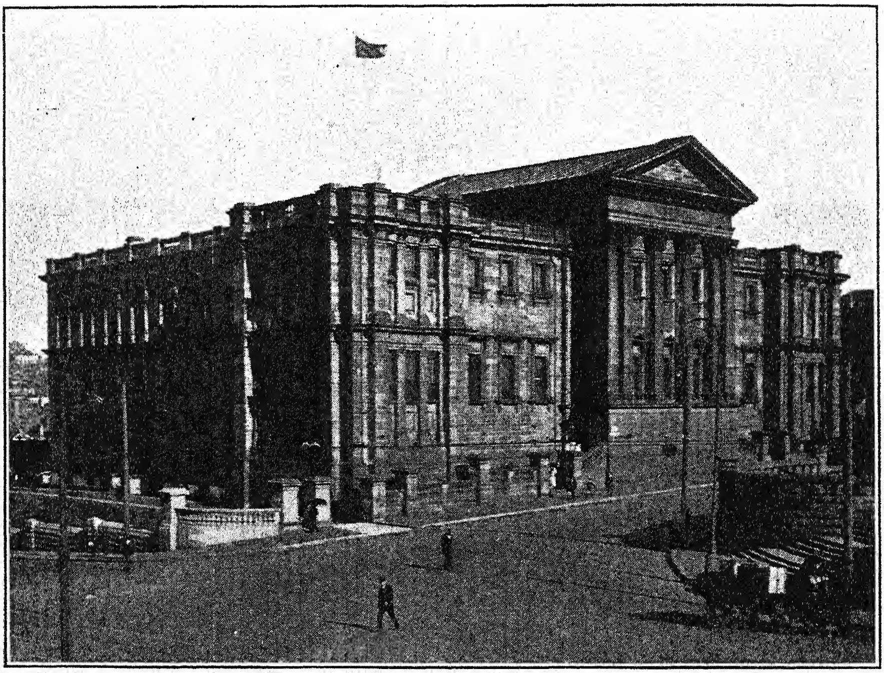
> Australian Museum—Towards the support of the Institution . . . £200.

The Museum therefore had received its present name in 1834, but the sum set aside for its support was still of very modest dimensions.

In 1849 the collections were transferred from the Court House, Woolloomooloo (now the Criminal Court, Darlinghurst), to their present home, the building of which had been commenced in 1846.

II. Buildings.

The Museum occupies a fine site in the heart of Sydney, on the corner of William and College Streets, facing Hyde Park on the west and Cook Park on the north; to the south is the Sydney Grammar School and to the east the William Street Girls' High School, both almost coeval with the Museum itself. The original building consisted of one room and gallery, forming



Photograph by G. C. Clutton

Fig. 1.—The Australian Museum, Sydney.

part of what is now the North Wing. The portion facing College Street, which may be called the Main Building, was added in the 'sixties, the North Wing was enlarged in 1892, and the South Wing, begun in 1897, was completed in 1910.

The building (Fig. 1) is constructed of Sydney sandstone, an excellent building material in appearance but apt to crumble with the years. The architectural style of the high central portion is described as Corinthian Classic, of the wings as Italian Renaissance. The woodwork is chiefly of red cedar, a fine durable timber, which is now difficult to obtain in quantity. While the building is externally imposing, the real requisites of

a museum building have been to some extent subordinated to architectural considerations, and, especially as regards lighting, the design leaves much to be desired. The old North Wing in particular is badly designed for exhibition of natural history specimens, the top lighting being very inadequate for a two-storeyed building, while the narrow galleries provide but little space for satisfactory display. In the early days the contents of the Museum were of a dual nature, embracing both natural history and fine arts, and it may be that here we have the explanation of the faulty planning of the North Wing. In 1869 an elaborate design for a combined Library, Museum, and Art Gallery was prepared, including the previously constructed portions of the building, and, although this design has not been followed in detail, the present building has followed its main lines, not without detriment to its suitability as a museum of natural history. In this plan the main entrance was from William Street, but owing to perversion of the original design the entrance is now from College Street, with a consequent lack of dignity and spaciousness in the entrance hall. It is recorded that in 1854 the Trustees reported that the building (the North Wing) was utterly unfit for the display of objects of natural history, a sentiment with which the writer agrees. One regrettable result of the design and piecemeal construction of the building is that it has been found necessary in the interests of display to depart now and then from a strictly systematic arrangement of the exhibits.

III. Government.

The affairs of the Museum were at first administered by a Committee, which also controlled the Botanical Gardens, but in 1854 a Board consisting of twelve Official and twelve Elective Trustees was established by Act of Parliament; this Board still functions, although control of the Staff is now vested in the Public Service Board.

IV. Contents.

The institution is essentially a museum of natural history and ethnography, and the collections fall into four main groups, namely: zoology, palaeontology, mineralogy, and ethnography. There is also a section of numismatics, including coins, medals and tokens, and a limited collection of archaeological and historical objects. Prominence is given to the natural history and ethnography of Australia, New Guinea, and the neighbouring

Pacific with its many island groups. Botanical specimens, except those of ethnographic interest, find no place in the collections.

Entering from College Street, the visitor finds himself in the Main Hall (Room 1) and encounters a number of exhibits of topical interest, recent additions to the collections, and a display of Museum publications and postcards. To the left are Rooms 2 and 3, devoted to the distinctive mammalian fauna of Australia, mainly marsupials. In the forefront is a large case showing an Antarctic scene, with seals, penguins, and other birds in a setting of sea and ice; the animals shown here were presented by the late Sir Ernest Shackleton and Sir Douglas Mawson, two celebrated Antarctic explorers. In wall and floor cases is a general collection of Australian marsupials, some of the smaller kinds in a natural setting, including a group of tree-climbing Kangaroos (*Dendrolagus bennettianus*), a pair of Native Cats (*Dasyurus viverrinus*) with their young, a pair of Rat Kangaroos (*Aepyprymnus rufescens*) with nest and young, groups of Cuscus, and of Possums at home among the trees, the nest of the tiny Flying Phalanger (*Acrobates pygmaeus*), and others. In one of the floor cases is a comprehensive collection of immature marsupials, many in the maternal pouch, and an unborn Scrub Wallaby (*Macropus malabatus*) suspended in the foetal membranes, an exhibit which disproves the curious belief still held by many Australian bushmen that the young marsupial is born in the pouch. The large extinct Kangaroo, *Palorchestes azael*, which was about nine feet in height when sitting on its haunches, is represented by a life-sized model. Of the monotremes, strange egg-laying mammals, which are entirely restricted to Australia and New Guinea, where they are represented by the aquatic Platypus or Duck-mole, and the burrowing Echidna or Native Porcupine, many specimens are shown, from the egg to the adult forms, including a small habitat group of Platypuses. Of the higher placental mammals one of the most striking exhibits is a cast of the dugong, shown on a sandy beach with a background of bush and palm. In a wall case will be found fine casts of Risso's Dolphin (*Grampidelphis exilis*) and of the Bottle-nosed Dolphin (*Tursiops catalania*). Other placental mammals shown are seals, bats, the dingo, and a large series of bush rats and mice. Suspended from the roof is the skeleton of a Sperm Whale, fifty-six feet in length, which was stranded at Wollongong, on the south coast of New South Wales.

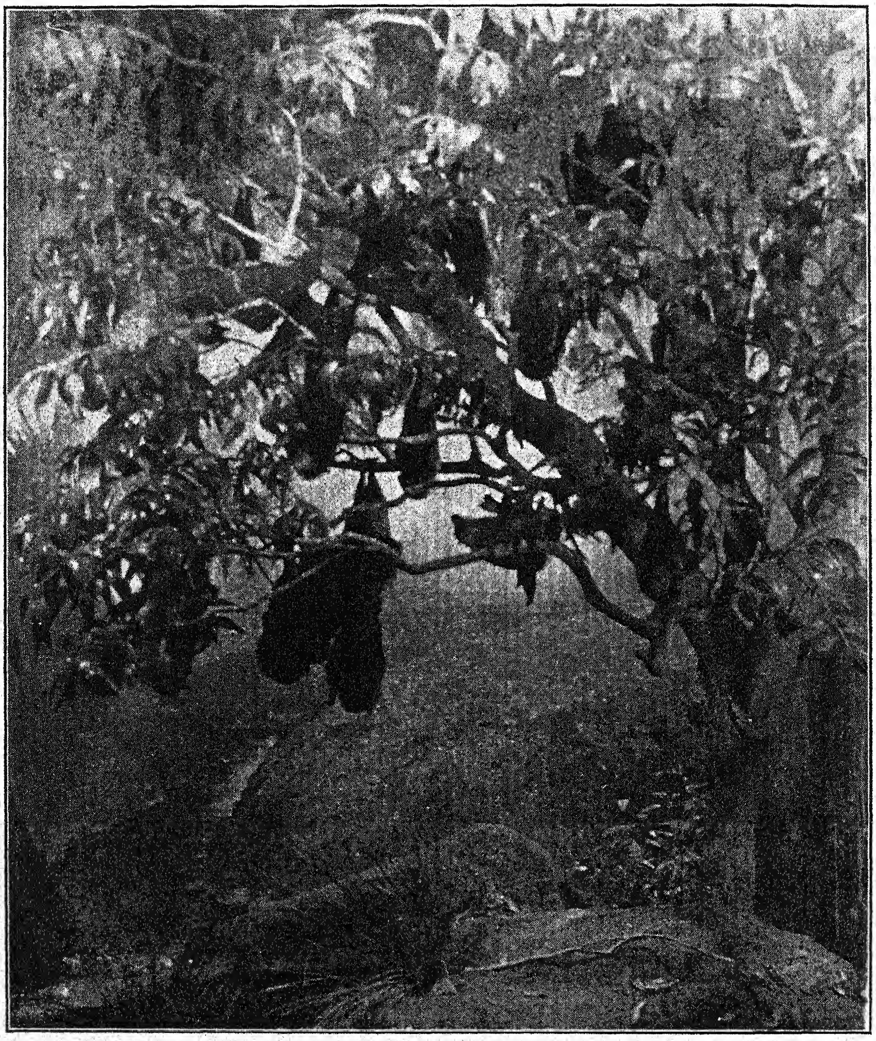
From Room 3 a short stairway leads down to Room 4

(North Wing), which contains chiefly the collection of fossils, the invertebrates, zoologically arranged, occupying the floor space, the vertebrates being accommodated in wall cases. A representative collection shows remains of Australian fossil vertebrates, including parts of the skeleton of such large marsupials as *Diprotodon*, *Nototherium*, *Thylacoleo*, and *Palorchestes*. A number of replicas of type and figured specimens, mostly those originally described by the late Sir Richard Owen, Director of the British Museum (Natural History), are also included, and there are some interesting remains of *Megalania*, a gigantic extinct lizard, nearly twenty feet in length, and of the curious horned turtle, *Meiolania*, which formerly lived in Australia and had allies in Lord Howe Island, Walpole Island (near New Caledonia), and also in South America. An interesting exhibit is part of the backbone of a plesiosaur (*Cimoliosaurus*) from White Cliffs, New South Wales, converted into precious opal. Foreign vertebrates are represented as fully as space will allow, including a series of forms from the caverns of Europe, such as the Cave Bear and Cave Hyaena, a nearly complete skeleton of Steller's Sea Cow (*Rhytina gigas*), parts of various hoofed mammals, a skeleton of the Great Auk and bones of the Dodo and of the Solitaire. Other extinct birds shown are leg bones of the Moas of New Zealand and of extinct struthious birds of Australia (*Genyornis* and *Dromornis*). Casts are exhibited of such famous specimens as the *Archaeopteryx*, *Mosasaurus camperi*, and *Andrias scheuchzeri*, and there is a fine original specimen of *Mystriosaurus*, an extinct crocodile from Holzmaden, Germany.

This room, as has already been mentioned, is the oldest part of the Museum, dating from 1849. Here in 1852 a ball was held to commemorate the arrival of R.M.S. "Chusan," the first mail steamer to reach Australia from Britain; in consequence the Museum was closed for a month. In this room too were assembled the specimens sent to the "Universal Exhibition of Agriculture and Industrial Products," held in Paris in 1855.

The room being very badly lighted, opportunity has been taken to utilize a number of bays along the north wall for the display of habitat groups lighted from within. These include groups of birds from Lord Howe Island: a Flying Fox (Fruit Bat) "roost" (Fig. 2), and nesting sites of the Lyre Bird (Fig. 3), and of the Boatswain Bird (Fig. 4). A particularly fine display is made by a case of Birds of Paradise, a black velvet background showing up the brilliant colouring of the birds

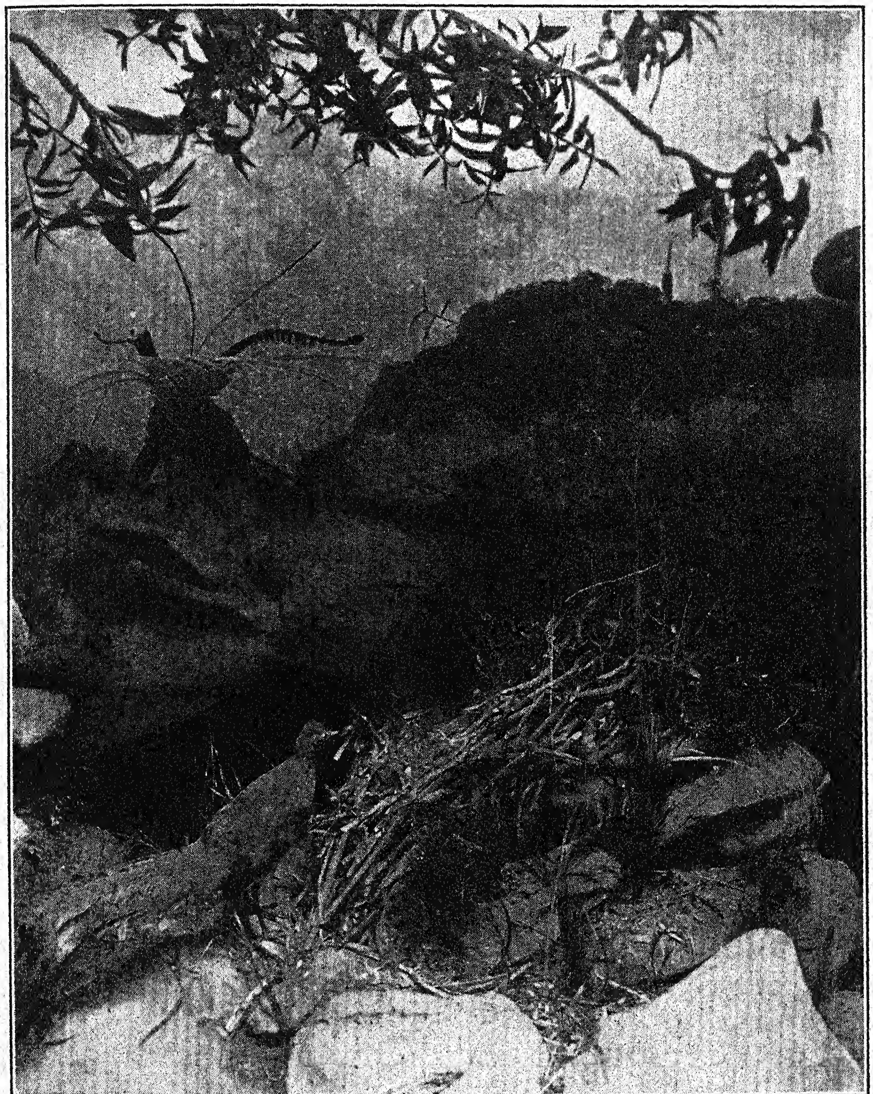
in a most effective manner. It is hoped that when the much-needed extension of the building takes place, it will be possible to use this room entirely for scenic and special self-lighted



Photograph by G. C. Clutton.

Fig. 2.—Flying Fox (*Pteropus potrocephalus*) Group.
The animals are hanging from the branches of a Eucalyptus tree.

exhibits of this kind, a purpose for which it is well suited. A platypus and a kangaroo group are already planned and will be added shortly.



Photograph by G. C. Clutton.

FIG. 3.—NESTING SITE OF LYRE BIRD (*Menura novae-hollandiae*).

The Lyre Bird frequents and nests in rocky gullies with thick shrub. The exhibit shows the female bird near the nest and the male bird in the act of display during which the plumes are brought forward over the head.

On the first floor gallery surrounding Room 4 is displayed the collection of minerals arranged according to the classification adopted in Dana's *System of Mineralogy*. An introductory series with explanatory labels illustrates the physical

properties of minerals and is followed by the systematic collection, prominence being given to Australian representatives. A particularly fine display is made by the minerals obtained in the upper zones of the famous silver mines of Broken Hill, New South Wales; these include cerussite, anglesite, stolzite, wulfenite, pyromorphite, and many others. Special exhibits in this gallery are a fine collection of large specimens, mostly of highly coloured minerals and a series of replicas of large nuggets, mainly from Victoria. Owing to exigencies of space and lack of floor accommodation, the meteorites, gemstones, and a series of gold exhibits are displayed in special cases on the ground floor of Room 4.

Photograph by G. C. Clutton.

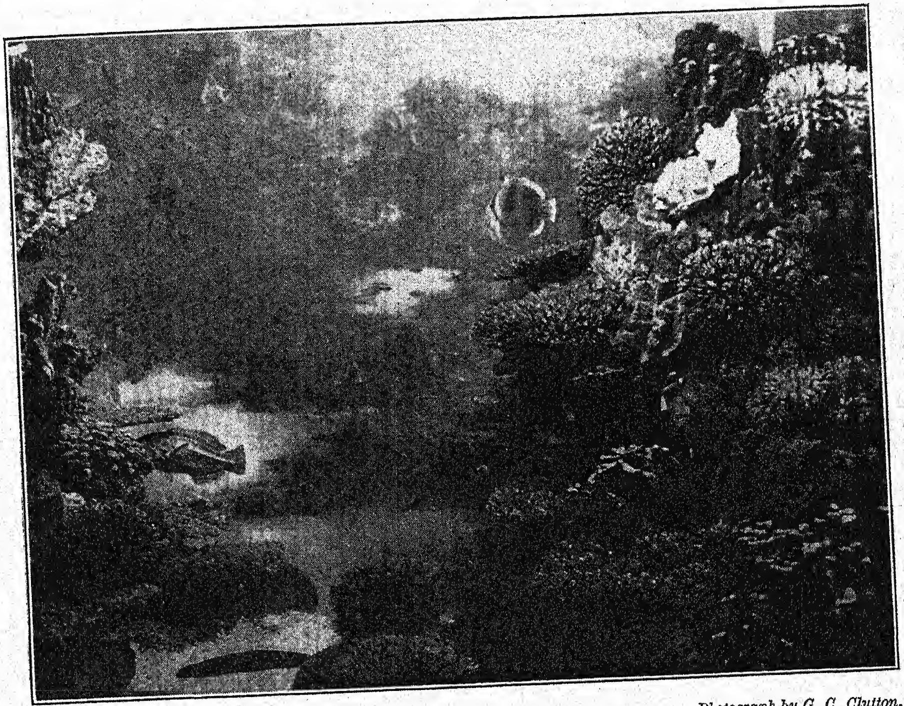
FIG. 4.—NESTING SITE OF BOATSWAIN BIRD (*Phaethon rubricanda*), LORD HOWE ISLAND.

A passage on the south-east corner of this gallery leads to the top of the main stairs. On the way will be observed a coral pool exhibit (Fig. 5), illustrating the Lord Howe Island coral reef, with its gaily coloured fishes, echinoderms, bêche-de-mer and other animals.

Returning to the main hall (Room 1) and turning to the right the visitor will find the collection of foreign mammals in Rooms 5 and 6. The most imposing exhibit is a tableau showing four African lions, superbly mounted, with a painted background depicting a veldt landscape, with animals and vegetation appropriate to the country. Other striking exhibits here are mounted specimens of the American Bison, of the Indian Gaur, and of the Indian and Sumatran rhinoceroses. In wall cases along the east side of Room 5 the carnivores are exhibited and Room 6 is mostly devoted to the hoofed animals, including an extensive series of African antelopes.

Turning left from Room 6, access is gained through a wide archway to Room 7, South Wing, which contains an exceptionally comprehensive collection of osteological specimens illustrating

the skeletal structure of vertebrates from fishes to man (Fig. 6). Attention may be called to a fine skeleton of the Irish Elk (*Megaceros hibernicus*) and to casts of *Diprotodon* and *Megatherium.* A case is devoted to a small dinosaur exhibit, including a cast of the skull of *Tyrannosaurus rex*, an original thigh bone and reduced model of *Camarasaurus supremus*, and cast of the thigh bone of *Rhoetosaurus*, a large Sauropod from Queensland, and



Photograph by G. C. Clutton.

FIG. 5.—CORAL POOL.

The exhibit represents part of the coral reef at Lord Howe Island, with its fishes, echinoderms, bêches-de-mer, and other creatures.

another to a series of casts of prehistoric human skulls, illustrating the geological history of man.

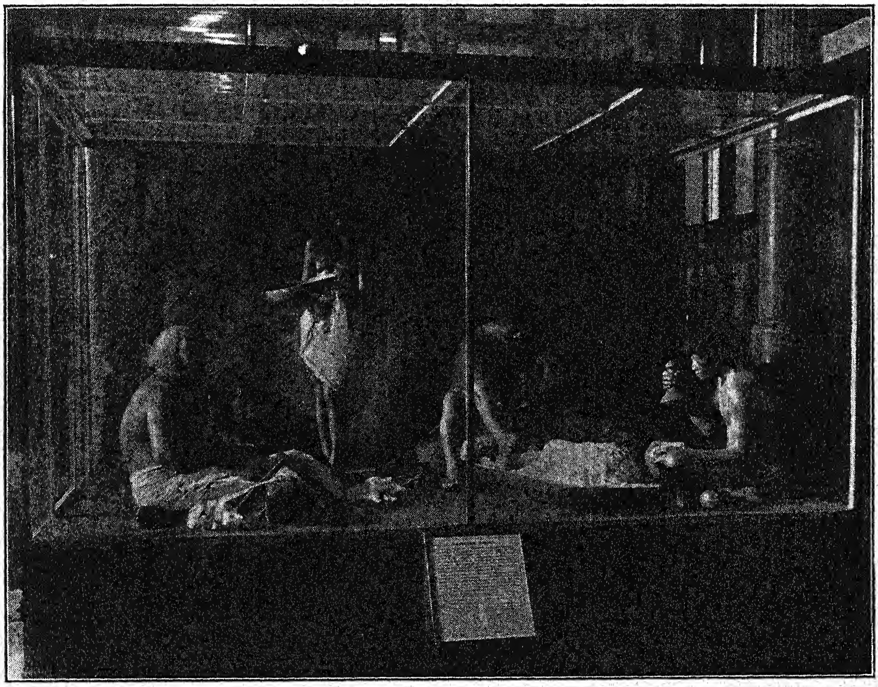
From Room 7 an archway leads to Room 8, which contains exhibits relating to the ethnography of Polynesia, Micronesia, and Melanesia (except New Guinea). Near the entrance is a striking tableau (Fig. 7) showing a Hawaiian family of four engaged in the manufacture of poi, a sort of porridge made from the taro root, and of tapa cloth, prepared from the bark of the paper mulberry.

Along the north wall is a selection of Polynesian objects,

Photograph by G. C. Clutton.

FIG. 6.—GALLERY OF OSTEOLOGY.
View from western end.

including some fine examples of Maori carving and feather cloaks, mere, tattooed heads, and a beautiful model of a war canoe. This is followed by series of exhibits illustrating the culture of southern and central Polynesia. Along this wall also the ethnography of Micronesia, including the Ellice, Gilbert, Caroline, Marshall, and Matty Islands is displayed. The wall cases at the eastern end contain a representative series of exhibits from the Bismarck Archipelago, among which the most



Photograph by G. C. Clutton.

FIG. 7.—HAWAIIAN GROUP.

The man and boy are making *poi* from taro root, and the woman and girl are preparing tapa cloth from the bark of the paper mulberry.

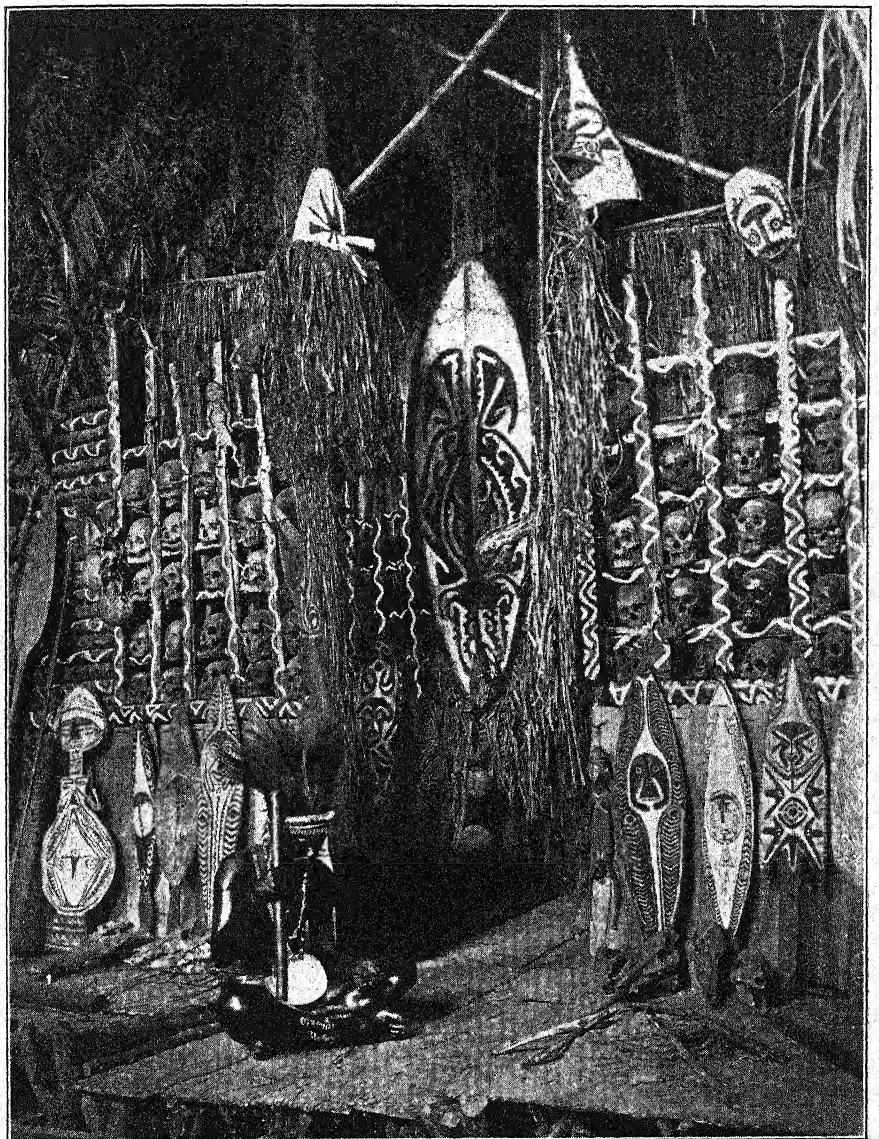
striking are the helmet and memento masks and the carved posts and figures, especially the carved mask-house posts, some of which are eleven feet in length. The south wall cases contain specimens from Buka and Malaita, Solomon Islands, including a number of canoes and paddles. Along the south wall too will be found an extensive series of objects from Fiji, comprising kava vessels, utensils used in cannibal feasts, baskets and pottery, and a number of dance and war clubs.

The Admiralty Islands are represented by a number of

exhibits in island cases in this room. These include food bowls of various types, some five feet in diameter, a collection of large oil jars, an immense drum seven feet in length and about three feet in diameter, and a splendid series of spears. In ascending the stairway to the first floor (Room 9) a good view is obtained of a Tomako or head-hunting canoe from Roviana, Solomon Islands; this fine example is forty-six feet in length and has accommodation for twenty-two paddlers. In Room 9 the ethnography of the natives of New Guinea is illustrated in considerable detail, including weapons and trophies, drums, stone implements, ceremonial objects and stuffed heads. There is a comprehensive display of Kaiva-kuku and other masks and maskettes and a number of canoe and house models. Perhaps the most striking exhibit is a Ravi (Fig. 8) or Men's Club-house from Urama, Delta Division, Papua; several cubicles are shown containing human skulls, various weapons and implements, ceremonial objects, and trophies of the chase. In the foreground is seated a Papuan warrior in full regalia. In a case at the back of the Ravi are some striking exhibits, notably a ceremonial tablet from Ambot village, Mandated Territory, carrying a human skull with pig-like snout fitted into a shield-like tablet studded with boar's tusks, seeds, and shells; this was used in initiation ceremonies.

From Room 9 we enter Room 10 (Fig. 9), wherein is displayed a collection illustrating the culture of the Australian aborigines. Here can be seen a fine series of baskets, bags, stone implements, grinding stones, bark and wooden vessels, and objects used in games and amusements. The collection of weapons is particularly extensive, embracing clubs, boomerangs, throwing sticks, spears, and shields. There are exhibits illustrating burial and mourning customs, implements used in fishing and hunting, totemic objects, message sticks, carved trees, rock paintings and hand marks. A large island case contains three full-size aborigines, a man in the act of throwing a boomerang, a woman, and a boy.

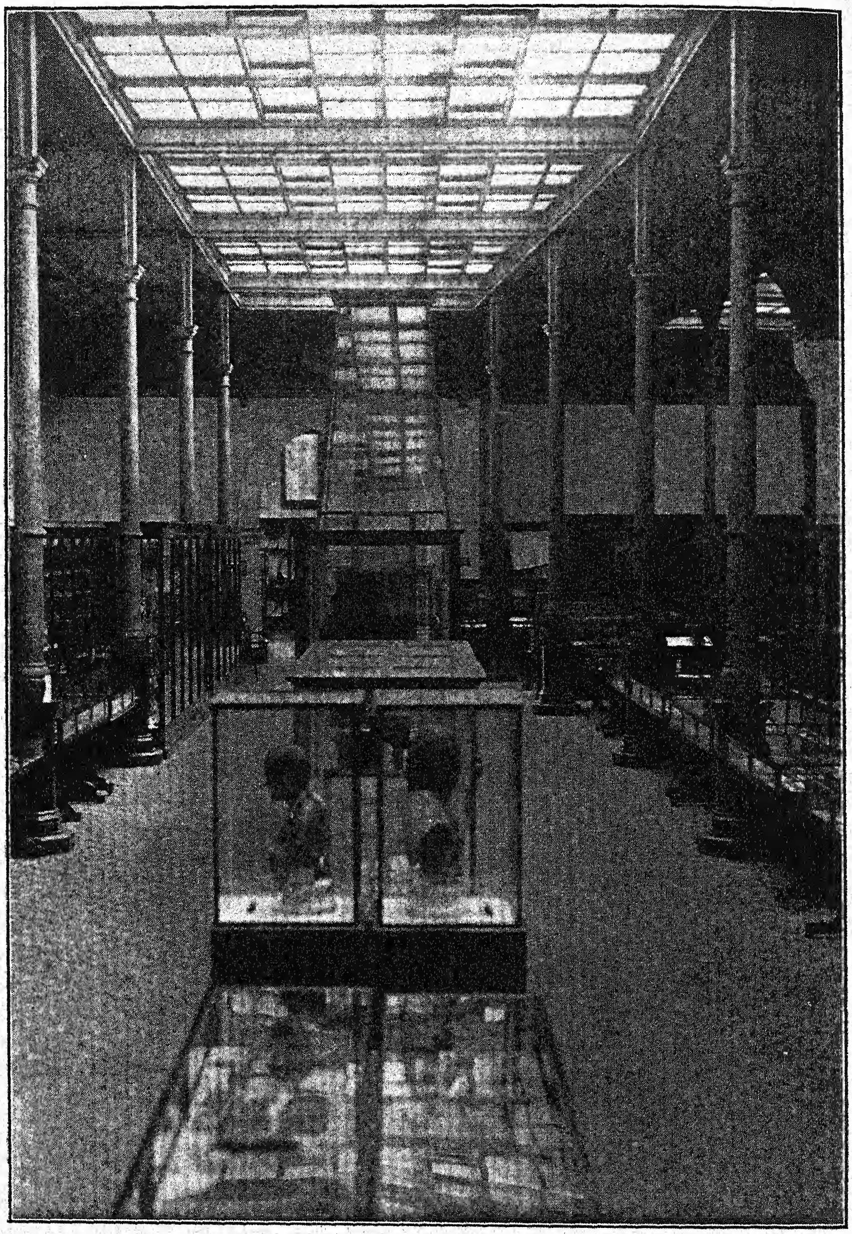
Near the western end of Room 10 is the collection of relics associated with the great navigator, Captain James Cook, including many priceless articles of great historical interest. The ethnography of Asia, Africa, and America is illustrated by a limited number of exhibits, and there is a small archaeological section including mummies and mummy heads from Egypt, and replicas of some famous stone tablets, such as the Rosetta and Moabite Stones, the Deluge Tablet, and the Black Obelisk of Shalmaneser II. There is also a series of palaeolithic and



Photograph by G. C. Clutton.

FIG. 8.—RAVI.

The Ravi is a club-house, set apart for the exclusive use of initiated men. The custom has a wide vogue in Papua. Here the men gather in the evenings for gossip, celebrate their return from a successful raid, and carry out certain sacred ceremonies. The carved boards known as *gopi* are supposed to protect the owner from enemies and malign influences, and the masks are used in various dances and ceremonies.



Photograph by G. C. Clutton.

FIG. 9.—ROOM 10, CONTAINING THE AUSTRALIAN ETHNOGRAPHICAL COLLECTION.
View from the eastern end.

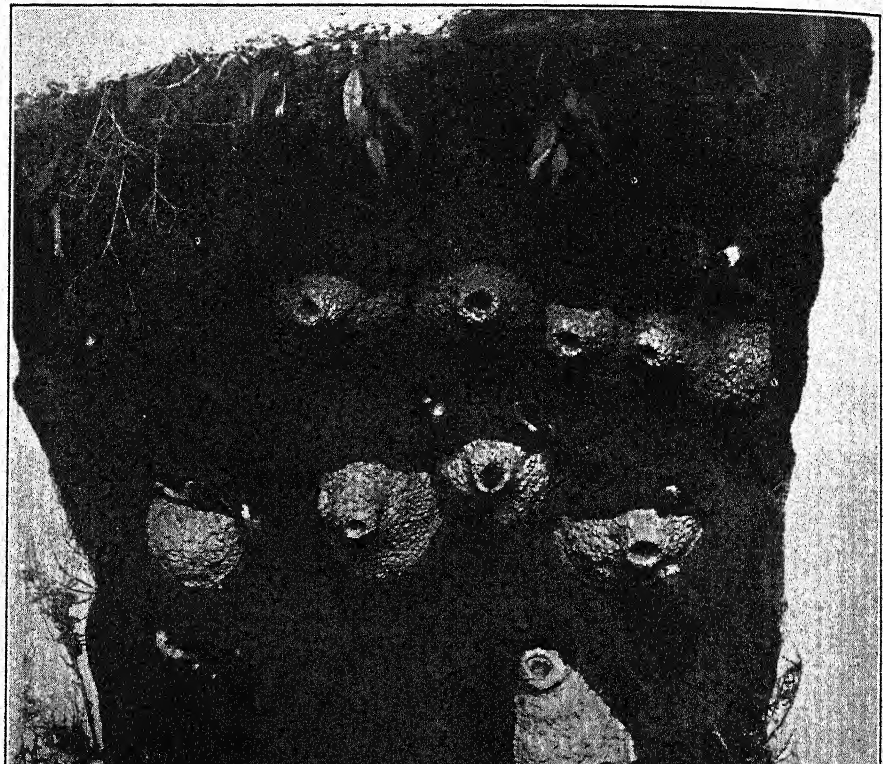
neolithic implements. Rooms 12 and 13, gained by an archway leading from Room 10, contain the collection of foreign birds, among which may be mentioned groups of toucans, trogons, and humming birds, and an exhibit of the remarkable New Zealand parrots, the Kakapo (*Stringops habroptilus*) along with its burrow, the Kea (*Nestor notabilis*), noted for its sheep-killing propensities, and the Kaka (*Nestor meridionalis*). A collection of game birds is shown in a wall case and there is a fine series of orioles, with their beautiful yellow plumage.

Room 14, immediately over the Main Hall, contains the collection of reptiles and batrachians. A large table case contains a number of crocodiles and alligators, and in others are several casts of snakes, mainly Australian, distinguished as harmless, venomous, and deadly. A beautiful enlarged model of a dissected viper's head shows the poison gland and apparatus. In another table case is the cast of a nineteen-foot python (*Python reticulatus*) from Malaya, a very fine specimen. The Green Turtle (*Chelonia mydas*) and Hawksbill (*Chelonia imbricata*) are represented by a series of specimens showing various stages from the egg to the adult condition.

From the floor of the gallery surrounding this room are suspended a number of large fishes, chiefly sharks and rays. A mounted example of the Queensland Groper (*Promicrops lanceolatus*), weighing 441 lb. is shown on this floor, and the cast of a Sawfish (*Pristis zysron*).

In Rooms 15 and 16 is the collection of Australian birds, which is a large and representative one, containing many attractive nesting groups. The elegance and bright colours of many Australian birds make this gallery one of the most striking in the Museum. The visitor will be attracted by the Bower Birds and their bowers, a nesting group of Fairy Martens (*Petrochelidon ariel*) (Fig. 10), a community of the Australian Weaver Bird (*Aplonis metallica*), and by the peculiar nesting habits of the Rock-warbler (*Origma rubricata*), Spotted Diamond Bird (*Pardalotus punctatus*), and the Bee-Eater (*Merops ornatus*); the two last make their nests in burrows. The versatility of the Magpie, the Piping Crow of the early colonists (*Gymnorhina tibicen*), is well illustrated by the series of exhibited nests of this ingenious bird, those constructed of fencing wire being particularly interesting.

From Room 14 a doorway gives entrance to Room 17, which is devoted to the collection of invertebrates. Near the entrance is a small series illustrating the characters of the Tunicata, curious marine creatures which in the larval stage exhibit some

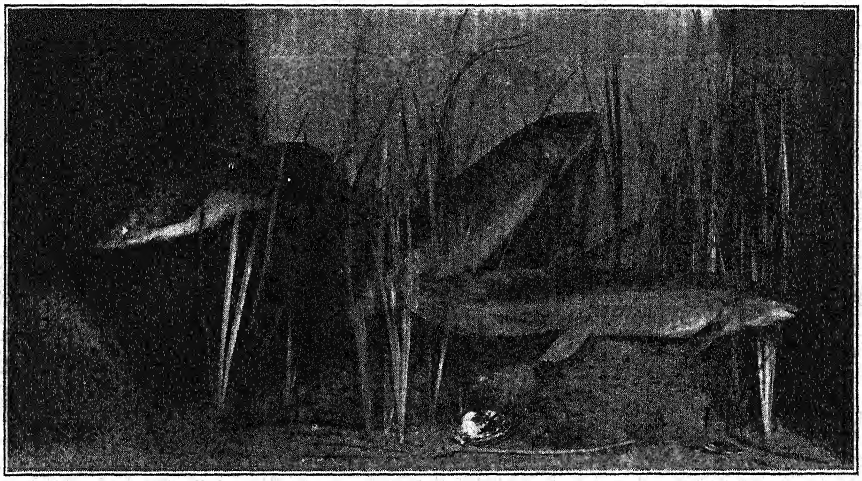


Photograph by G. C. Clutton.

FIG. 10.—NESTING GROUP OF FAIRY MARTENS (*Petrochelidon ariel*).
The nests are bottle-neck in shape.

of the characters appropriate to vertebrates but do not fulfil the promise of their youth and degenerate into sessile forms with hardly a trace of vertebrate relationship.

At the west end of Room 17 is the collection of insects and arachnids, the wall cases being devoted largely to the elucidation of the characters and life histories of insects, the various Orders being represented by typical examples. Enlarged models are exhibited explanatory of the structure of a beetle, the honey bee, and a spider, and a series of exhibits illustrates the ravages of white ants, which are so destructive to timber in Australia. The highly poisonous spiders *Atrax*



Photograph by G. C. Clutton.

FIG. 11.—QUEENSLAND LUNG-FISH (*Neoceratodus forsteri*) GROUP.

robustus, *Atrax formidabilis*, and *Latrodectus hasseltii*, the bites of which are as much dreaded as those of venomous snakes, are well represented by specimens and figures.

The remaining wall cases contain a general collection of invertebrates, Crustacea, worms, echinoderms, corals and others. The large collection of Mollusca is exhibited in balustrade and table cases, an introductory series setting forth the structural features of shells which form the basis of their classification and supplying an index to the various families.

Returning to Room 14 and ascending a flight of stairs the visitor reaches the Fish Gallery which surrounds Room 14. On the landing will be found a number of interesting exhibits, including a group of Queensland Lung-fishes (*Neoceratodus*) (Fig. 11), a cast of the Oceanic Angler Fish (*Ceratias holboelli*)

showing the diminutive male parasitic on the much larger female, and casts of the Ribbon Fish (*Trachipterus jacksonensis*), Giant Ray (*Bathytoshia brevicaudata*), and of a female Wobbegong Shark (*Orectolobus*), with a number of young. A very beautiful cast is that of the Chinaman Fish (*Paradicichthys venenatus*), a brilliant red fish which is intermittently poisonous.

V. Publications.

Most of the researches carried out by the scientific staff of the Museum are published in the Museum's own publications, which consist of *Records*, *Memoirs*, *Reports*, *Catalogues*, and *Miscellaneous*. A popular journal, *The Australian Museum Magazine*, is now in its fifth volume.

VI. Educational Work.

The Museum has a well-appointed Lecture Hall with a cinema projector, and here popular science lectures are regularly delivered, admission being free. Lectures are also given to school-children, college students, and members of various educational and other organizations.

BEHIND THE SCENES IN THE MUSEUM. VII.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

It was explained in the last article that, while the Department with the general name of Geology deals with the more restricted field of palaeontology, the Department of Mineralogy is concerned with the wider field of rocks, ores, and minerals. Thus there come within its province the basic structure of our earth and the evidences, as afforded by meteorites, of the nature of other worlds. It is therefore a Department of particular interest, with one of the most attractive spheres of inquiry and a general technique of very high quality.

Territorially the Department is one of the smallest, having half of the Basement floor and the whole first floor of the eastern wing, with a two-roomed chemical laboratory on the extreme north side of the central Basement. As practically the whole of its largest portion is devoted to the public exhibition gallery, it will be seen that its wide field of work has to be

accomplished in somewhat restricted quarters. Its staff is similarly small, and is in fact the smallest Departmental Staff in the Museum. The scientific staff consists of the Keeper, Dr. L. J. Spencer, C.B.E., Sc.D., F.R.S., one Deputy Keeper, and two Assistant Keepers, together with one unofficial worker. The clerical and technical staff numbers eight, who are employed in such varying ways as constructing apparatus, chemical analysis, cutting rocks and minerals, cataloguing, typing, writing labels, and attending upon the scientific staff. This staff is of necessity very specialized along lines which have little connexion with the other, biological, Departments.

To many it may seem strange that any particular stress need be laid upon the numbers and experience of these men and women behind the Departmental shop-front. Rocks are rocks, unlikely to decay, common enough in almost everyone's experience, and once it is arranged and exhibited the collection can surely be left to itself. Indeed, there are many who express surprise at seeing exhibited the sort of things which they have upon their garden path or which infest the beach down which they walk to bathe. Most of the exhibits, of course, are minerals, many of which are strikingly beautiful, and some of which are very valuable. The exhibited collection has many fine jewels and much fine gold. But few persons realize the enormous amount of research work that is done on minerals and their associations, and how important in all sorts of ways the results of this research are.

Minerals are simply chemical elements or compounds found in nature. Sometimes they appear very attractive in their natural condition; often they have to be changed by chemical means into other forms or have to be cut and polished so that they sparkle attractively. The use of minerals is diverse. Coal, calcite, diamond, and quartz are some whose uses are well enough known to everyone, while among the metals, gold, silver, copper, iron, and lead are sufficiently notable. Chemically each of these substances may be found combined with other materials so that a large variety of different minerals is known, varying in wide degree in appearance, crystal structure, and in their reactions to moisture, light, and heat.

Thus, even in the public gallery of the Mineral Department, a great deal of technique is actually obvious to the visitor, if only he pauses to think how such a large variety of so dissimilar substances can be placed safely on exhibition. To explain this further it is only necessary to point out that cut and polished spheres act as lenses and direct sunlight falling

upon them might be focused so as to set fire to the case; some crystals change colour on exposure to light, others crumble away if subjected to an excess of moisture or dryness, while still other and attractive specimens would be transferred from the care of the Museum to that of less reputable persons if opportunity were afforded. Every one of these and other contingencies have to be provided for, so that the exhibition of minerals is not achieved by dumping a load of specimens in a case, or even by spacing them nicely apart and providing neat labels.

Few people realize how truly attractive the story of rocks and minerals is, or how really beautiful the microscopic appearance of many can be. These, the fundamental things of our everyday world, are actually of extraordinary complexity which requires the highest scientific knowledge and the most modern equipment to fathom, and they display on examination a beauty which is not surpassed by the more obvious portions of nature's garb, such as the birds and the flowers. A good deal of that story and that charm is on evidence in the public gallery and it may be asked what all this has to do with the work of the Mineral Department. Well, Bryan Proctor, the nineteenth century poet, wrote :

> He that can draw a charm,
> From rocks, or woods, or weeds, or things that seem
> All mute, and does it—is wise.

And the work of the Department is a constant display of this wisdom, a constant drawing of this charm, so far as rocks and their elements go, to turn it to public ends.

The Department contains quite a large number of specimens of the original Sir Hans Sloane collection, most of which were collected either for their appearance, for curiosity, or for use in some form of medicine. Until the end of the eighteenth century, however, there was no real attempt to look after the minerals as scientific objects. At this time the Departments were all under one name, but over eighty years later the Department of Geology and Mineralogy was created, although most, if not all, of its officers were interested exclusively in palaeontology. This state of affairs and neglect of the minerals continued until 1857, when that Department was divided into the Department of Geology and the Department of Mineralogy. From that date the collection, the staff, and the equipment have steadily progressed until now the Department is equal to any in the world. The collections come from every part of the world where man or woman has been, and from many places

which no human being has ever visited. They come from the cold and mysterious realms of space, from the depths of the seas, from the interior of the volcano: they have been brought from the heart of the desert, from the cold face of Everest, and even, with the other tragic records, from the sledge of Captain Scott's ill-fated South Polar expedition.

Almost every specimen is therefore not merely a mineral, to be studied and analysed, or a thing of beauty to be appreciated, but it is also a tangible piece of history, bearing testimony to natural processes and forces and to human endeavour. In the Mineral Department there exists the very valuable habit of retaining every scrap of the history of each specimen and every notebook of the scientific work of the staff, so that not only does the Department conserve minerals, but it looks after history as well, which is a truly valuable function.

As in the other Departments of the Museum, the specimens on arrival are carefully examined, identified, registered, and labelled. The registration consists in affixing a label, bearing the year and a number. There is a General Register, including minerals, meteorites, and rocks, and a special one for the rocks in which more details are given. Special attention must be given to the nature of the material, so that it can be exhibited or stored in the condition which will not be harmful to it. Particular attention is given to the labels, which always bear the essential history of the specimen and which are made of pure rag paper, which lasts indefinitely.

Minerals and meteorites are stored in the drawers below the exhibition cases in the public gallery, but the rocks are all stored in the Basement. In all cases, however, they are easily accessible for study, and card-indexes are maintained with full particulars. An interesting feature of the Rock Collection is that it is stored not topographically, but in collections as a whole. In this way the entire results of a comprehensive expedition are together, each specimen bearing a consecutive number. As the card-cataloguing is good, this method of arrangement saves time in finding specimens, and saves storage space, both matters of Museum importance.

The detailed examination of rocks and minerals is a somewhat complicated process, including many technical methods and much expensive and delicate apparatus.

Both rocks and minerals may be examined optically by means of a special petrological microscope, which permits a thin slice of the specimens to be seen by both ordinary and polarized light (i.e. light in which the vibrations of the rays have been

modified artificially). The stage of this microscope, upon which the rock slice is held in position, is of complicated structure and permits of rotation, lateral, and other movements, whereby the optical properties and the size and thickness of particular crystal fragments may be determined. The Fedorov universal stage, especially useful in the optical determination of the minerals known as felspars, is used in the Department.

All the thin sections of rocks examined in this way are cut

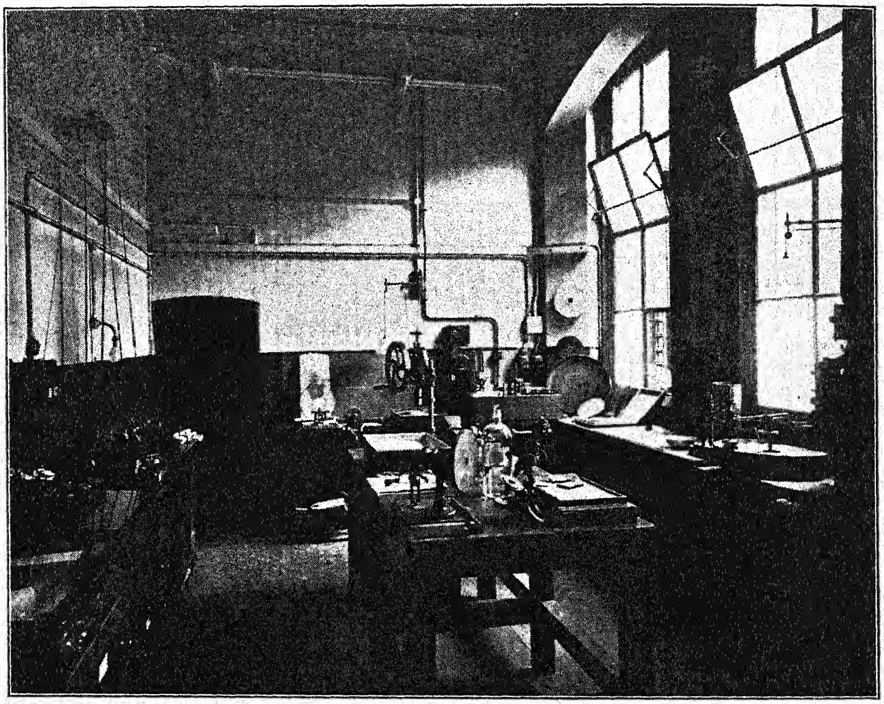


FIG. 1.—DEPARTMENT OF MINERALOGY : WORKSHOP.

in the workshop (Fig. 1) where there is also made a large quantity of apparatus for use in the chemical laboratory and the X-ray room. The workshop contains the usual lapidary's wheels, polishing disks, and lathe, the power being electrical. It is perhaps not generally realized that a great saving is constantly being made in the cost of apparatus here, as so much is done by a technical staff sufficiently skilled to construct reliable apparatus and acquainted with the precise details of the individual requirements.

Microscopic methods are, of course, by no means the only

method of mineralogical or petrological investigation, and there is a very adequate outfit of apparatus such as cameras, spectroscopes, goniometers, and refractometers for study purposes. Some forms of these are the inventions of members of the scientific staff.

A method of crystal examination of great value is now afforded by X-ray examination and photography. Accordingly, an X-ray outfit, worked at 90,000 volts, has been installed

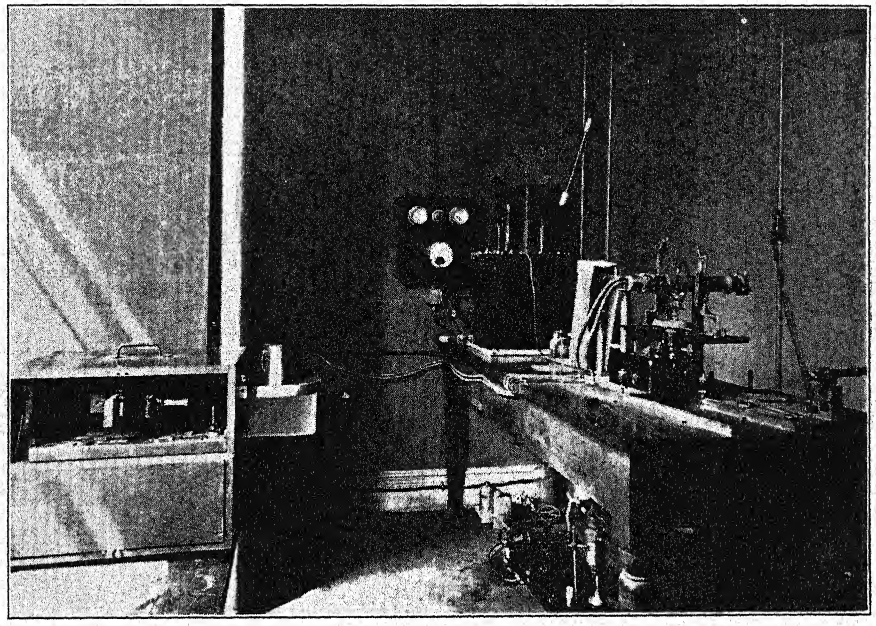


FIG. 2.—DEPARTMENT OF MINERALOGY: X-RAY APPARATUS.

(Fig. 2). The X-ray tube is the same kind as that used in medical work, but otherwise there are modifications and the resultant photograph of the crystal differs from the sciagram, or shadow photograph, usually employed in medicine and dentistry. The photograph gives a clue to the structure of the crystal and the arrangement of its atoms, and from it a plan of the structure of the molecule can be obtained and even a model of the atomic arrangement can be prepared. Such a model is illustrated in Fig. 3. Naturally such processes are elaborate and not without danger, so that strict precautions are taken against the entry of unauthorized persons, and automatic danger signals give warning outside the room while the X-ray apparatus is in operation. The amount of work that is

accomplished in this section for the Museum and for other institutions is considerable.

Chemical examination of rocks and minerals can also be made, for the Department possesses a fully equipped laboratory for this purpose. The technical methods employed are com-

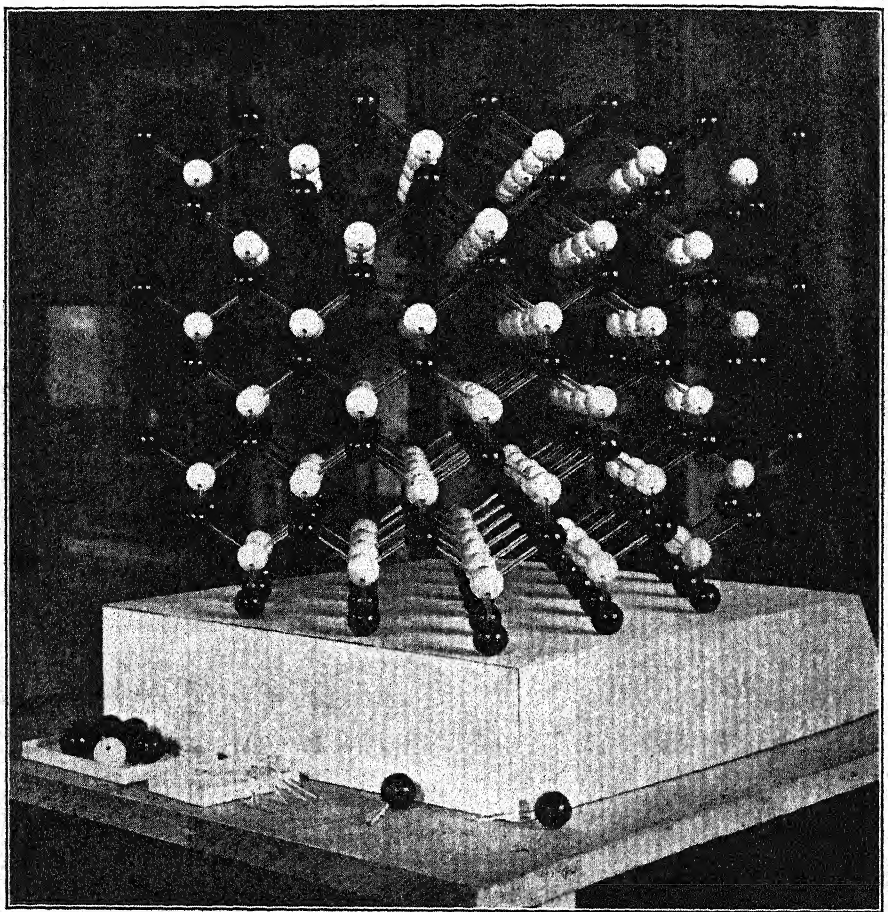


FIG. 3.—DEPARTMENT OF MINERALOGY: CRYSTAL STRUCTURE MODEL.

plicated, requiring valuable apparatus and a high degree of personal efficiency, as rock analysis is a particularly difficult chemical task. The laboratory consists of two rooms (one of which is shown in Fig. 4) with the usual laboratory equipment of benches, fume chambers, bunsen burners, and, of course, chemicals, crucibles, beakers, etc. In this laboratory, however, there is also a very efficient electric furnace, thermostatically

controlled, and connected with an electrical thermometer registering on a dial. This is very necessary as the heat required to melt rocks or mineral substances is very great, and in many operations the maintenance of a fixed temperature is necessary. In the other room, away from the furnaces and ovens are facilities

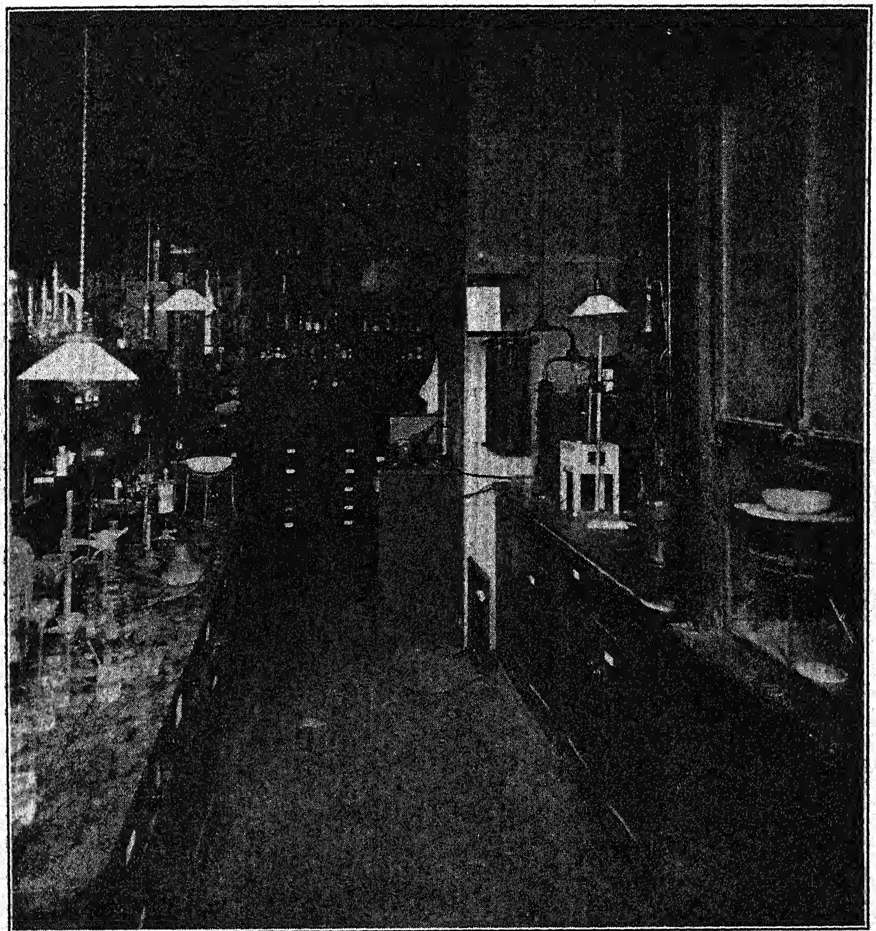


FIG. 4.—DEPARTMENT OF MINERALOGY: CHEMICAL LABORATORY.

for making very fine measurements. Here there is a colorimeter for directly comparing the depth of colour of two solutions. There is also a specially fine balance capable of measuring so little as one thousandth of a milligram, that is, the incomprehensible amount of one 450-millionth of a pound! So delicate is this balance that even the heat radiated from the person

working it affects it, so that the most careful shielding of the whole apparatus is continuously necessary, and the scale readings are made through a small telescope.

Such precision in physical methods is necessary in this work and a wide knowledge of both organic and inorganic chemistry is essential. Almost any sort of substance may be sent to the laboratory for examination and identification. Recently, as was described in the newspapers, a parcel was received through the post from another museum, which the local authorities had been unable to identify. The material was tested in the laboratory here and proved to be T.N.T. (trinitrotoluol), a well-known high explosive.

Ultra-violet light is also used as an aid to identification; but a demonstration of this is available for the public in a special case just outside the entrance to the exhibition gallery.

Enough has been said to show that the determinative processes of the Mineral Department are particularly specialized and of great interest. In common with the other Departments there is always a large amount of correspondence, a large number of inquiries, and numerous students and visitors. Accessions, too, occupy much time, and donations and exchanges are always being made. The Mineral Department has been especially helpful to some Dominion museums.

During 1933 no fewer than eighty-seven students worked in the Department. About 2000 specimens were added to the Collection, but it may be pointed out that this is an unusually low number, accountable through the exorbitant prices which are now demanded for some minerals and by the generally difficult financial situation. At the present time the Collection contains something like 200,000 specimens of which about 60,000 are rocks or rock-sections. This number is approximate, because occasionally a few specimens are included under the one number and it is often difficult to draw the line between what is one specimen and what is really a group of joined crystals. At any rate this number is sufficiently large to cause a great amount of constant work in renovation, cleaning, preservation, and exhibition.

The meteorites especially call for attention, since they are so liable to disintegration through rust and are so difficult to make into instructive exhibits. In the gallery it will be noticed that many of them have polished faces to exhibit the internal structure. It is difficult, or, rather, laborious to make this polished section and it has to be very carefully cleaned, covered with a protective solution, and finally sealed under a close-

fitting glass plate. Every detail of exhibition methods requires careful thought. Everything does mean something, if often it is only hard work.

As in other Departments there is an excellent library, of great utility and probably the finest of its kind in the world (Fig. 5). It is estimated to contain 10,000 books, 20,000 pamphlets, and 600 maps.

There is also a constant output of scientific papers from the staff and twenty-three were published in 1933. Only those

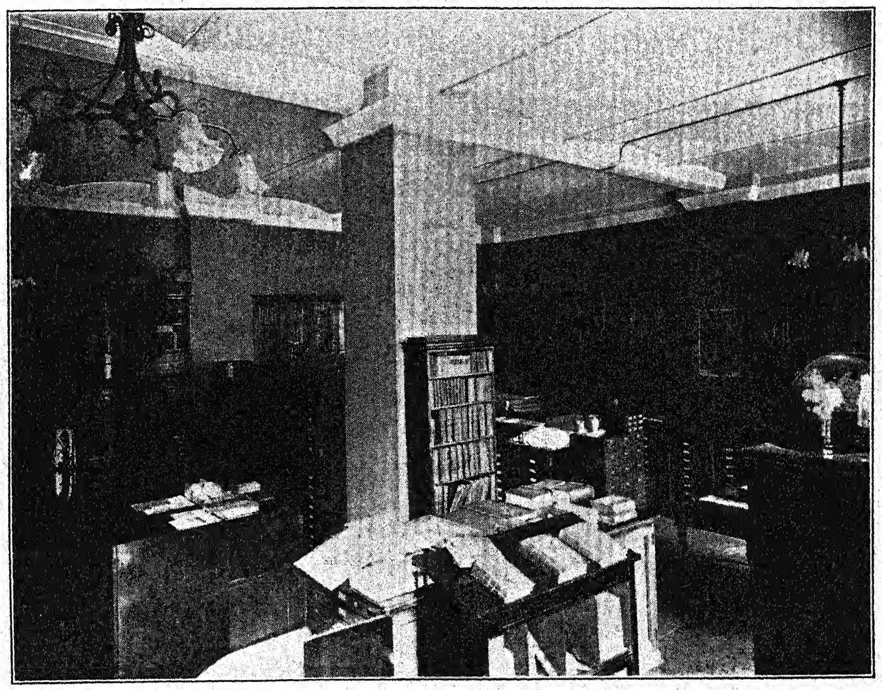


FIG. 5.—DEPARTMENT OF MINERALOGY: PART OF THE LIBRARY.

who have experienced the trials of authorship and research under a constant bombardment of correspondence, visitors, students, with considerable routine duties, and with but a small staff, can fully appreciate the excellence of this performance.

With its strong historical outlook, the diversity and high standard of its complex research work, and the numerous special endeavours to make the subject of mineralogy attractive to the general public, the Department amply proves that, though it is the smallest numerically, it is certainly by no means least in true museum technique.

PIGMY ELEPHANTS.

By Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

Is there such an animal as a real pigmy elephant alive to-day, comparable with the pigmy hippopotamus of West Africa? The answer, based on our present knowledge of the elephants of Africa, is in the negative. This answer must not be taken to mean that there is not a small race of elephants, living in the forests of central and western Africa, but that there is at the present time no evidence forthcoming of the existence of a really dwarf or pigmy species or race of elephants, comparable with the dwarf species that existed in the distant past.

We have had two dwarf elephants described in recent years, the one from the Congo (*Elephas africanus fransseni*) and the other from the Cameroons (*Elephas africanus pumilio*); the first of these appears to have been founded on immature material, and the second was a small animal kept alive in captivity, which proceeded to grow up, and went on growing until it had assumed the normal dimensions of *Elephas africanus*! This is a lesson to the systematist to make sure that his types are dead. There was a somewhat similar case in connexion with a so-called new race of a central African bay-cat some years ago, which was described as a new form on account of its strange colouring. The type specimen was, however, in the Zoological Gardens, instead of being safely skinned and put away in a museum collection, and it gradually changed its coat until the normal coloration was assumed. One hesitates to think how upset some zoologists would be if their types came to life and acted in this manner!

About two years ago Sir Arnold Hodson, K.C.M.G., Governor of Sierra Leone, presented the Museum with the skull of what he termed a "jangai," or small forest-elephant, together with the sole of a hind-foot and tail of an animal known as the "sumbi," a so-called dwarf race or species of elephant. These specimens were from the Gola Forest in Sierra Leone and Sir Arnold promised to send more material when it was available. The Museum has now received seven additional skulls from the same donor, and two of them are of the so-called dwarf elephant or "sumbi." The latter are, beyond any question of doubt, the skulls of young elephants, as is proved by the dentition and the open sutures between the various bones of the skulls.

There remains the difficult problem of the other six skulls,

which, although none of them can be called old, are not really young, and yet they are all very much smaller than the skulls of the ordinary bush-elephant, so much smaller that some systematic notice must be taken of the differences in size between

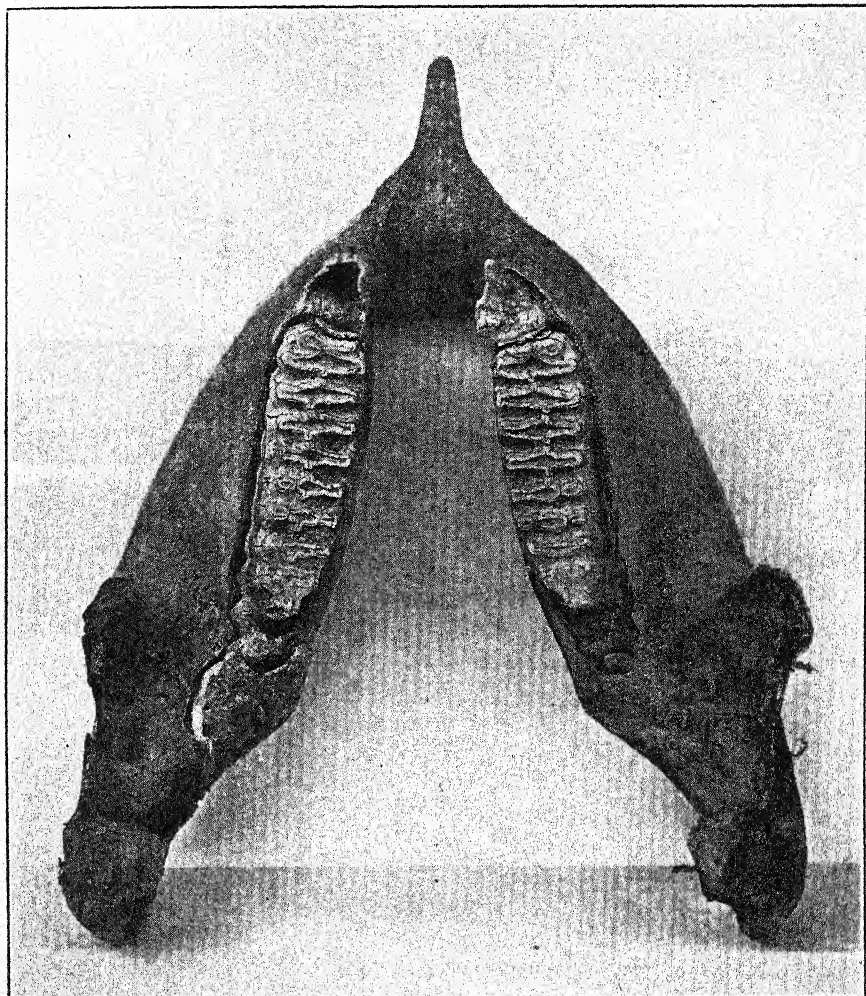


FIG. 1.—LOWER JAW OF FOREST-ELEPHANT FROM THE GOLA FOREST, SIERRA LEONE.

the two series. There is reproduced here (Fig. 1) a photograph of the lower jaw of the first skull sent home from the Gola Forest, and it will be evident, on a careful examination of the teeth, that in spite of the number of plates or ridges exhibited by the tooth in wear, there is still another tooth, presumably

the last true molar, to come up. The possession of so many ridges by the second true molar is against all that has been laid down in the text-books; this tooth is usually stated to be made up of 8 or 9 ridges, whereas the tooth in use in this lower jaw presents at least 10 or 11 ridges, which is the number of ridges usually found in the last lower molar. Evidently we shall have to think twice before dogmatically stating that the ridge-formula of the African elephant is $\frac{3}{3}\cdot\frac{6}{6}\cdot\frac{7}{7}\cdot\frac{7}{7}\cdot\frac{8}{8\text{–}9}\cdot\frac{10}{11}$.

From a careful examination of these Gola Forest skulls it would seem that they undoubtedly represent a smaller elephant than the colossal skulls from the bush and open country, and fortunately for the writer, a name is available for this small forest-elephant; it may be called *Elephas africanus cyclotis.*

There, of course, still exists the possibility of the discovery at some future time of a really dwarf elephant either in the Gola Forest or elsewhere in Africa; there was a rumour only the other day of a pigmy elephant living in the swamps near Lake Ngami in South West Africa, and there is no telling what a thorough survey of the Congo and West Africa might bring to light. Sir Arnold Hodson is almost convinced of the existence of a dwarf elephant in Sierra Leone, and he intends to continue collecting until he settles the matter one way or the other.

In corroboration of Sir Arnold's discovery it is interesting to find that Major P. H. G. Powell-Cotton, the well-known big-game hunter, has shot in the Cameroons a very similar forest-living elephant, which would appear to represent the same, or a closely allied, race. In the accompanying photographs (Figs. 2–4), kindly supplied by Major Powell-Cotton, a comparison is made between the skulls of this small forest-elephant of the Cameroons and that of a female bush-elephant also from the Cameroons. In fig. 2 the skull in the centre is that of an immature male forest-elephant; that on the right being an old female of this same race, and that on the left the female bush-elephant; all three are photographed from the left side. In fig. 3 we have a front view of the same skulls, and fig. 4 shows the cheek-teeth of the two female skulls.

The upper teeth of the old female skull of the forest-elephant are seen to better advantage in fig. 5, which shows the last molar in wear on both sides, that of the right-hand side is just pushing the last fragments of the second true molar out of the way, and on the other side, owing to an abnormality in the cheek-teeth, the last molar is already showing extensive signs of wear.

From an examination of these Cameroon skulls, which

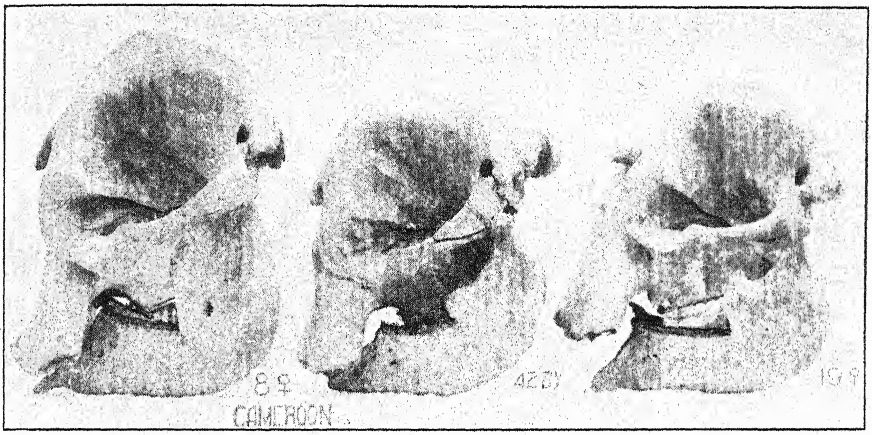


FIG. 2.—SIDE VIEW OF SKULLS OF FEMALE BUSH-ELEPHANT AND MALE (IMMATURE) AND FEMALE FOREST-ELEPHANTS (CAMEROONS).

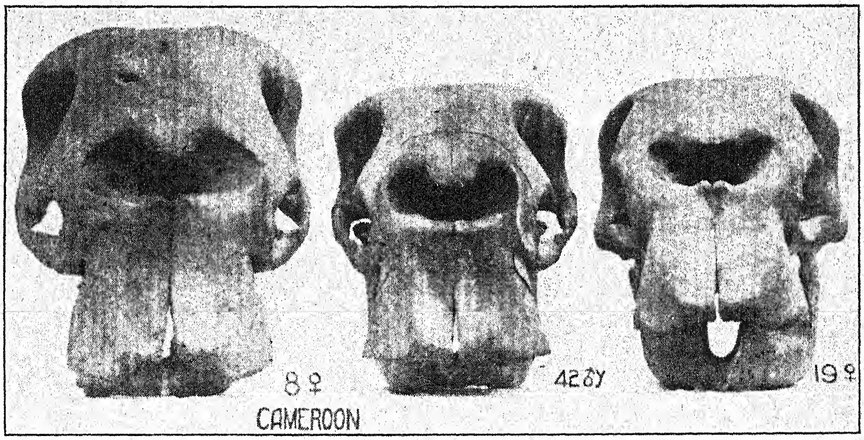


FIG. 3.—FRONT VIEW OF SKULLS OF FEMALE BUSH-ELEPHANT AND MALE (IMMATURE) AND FEMALE FOREST-ELEPHANTS (CAMEROONS).

FIG. 4.—CHEEK-TEETH OF FEMALE BUSH-ELEPHANT AND FEMALE FOREST-ELEPHANT (CAMEROONS).

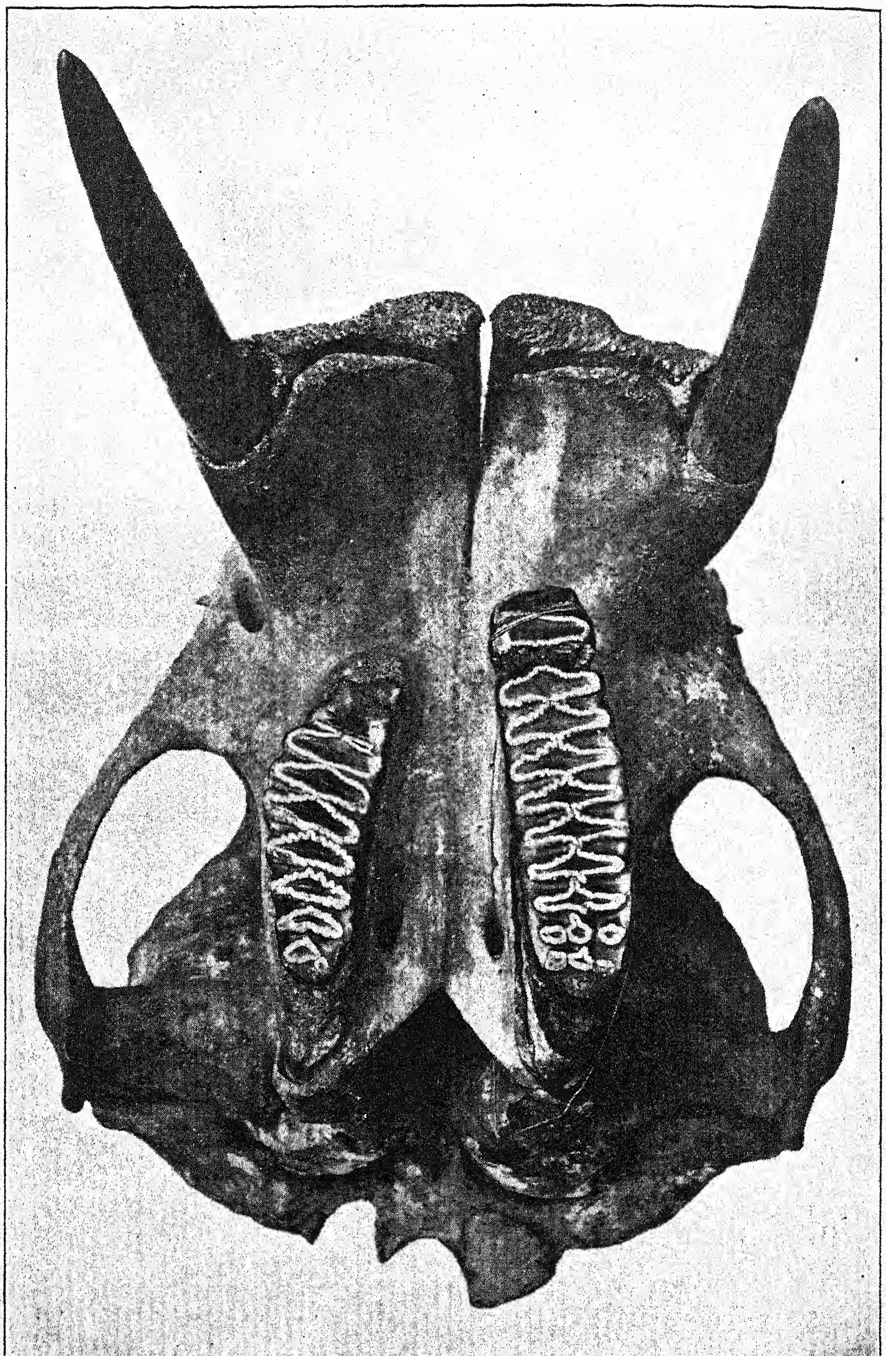


FIG. 5.—VENTRAL VIEW OF SKULL OF FEMALE FOREST-ELEPHANT (CAMEROONS).

Major Powell-Cotton kindly sent to the Museum for this purpose, it is evident that here again we have proof of the existence of a small species or race of elephant which is an inhabitant of a dense forest-zone. This Cameroon forest-elephant may provisionally be referred to the same race as the Gola Forest elephant, that is *Elephas africanus cyclotis.* It is possible when more is known concerning these forest-elephants that the Sierra Leone and the Cameroon animals will be found to be racially distinct; the forest-elephants of the Eastern Congo will, perhaps, prove to represent a third race, and further races may be found inhabiting the other forested areas of Africa.

BOOK NOTICES.

Budgerigars in Bush and Aviary. By NEVILLE W. CAYLEY. Pp. xviii + 148, with 6 plates in colour and 9 monochrome illustrations. (Sydney: Angus & Robertson Limited; London: Australian Book Co. 1933. 7*s.* 6*d.*)

THE Budgerigar is probably the best-known Australian cage bird, and in many countries there are special clubs devoted to its welfare. This little Australian parakeet has sprung into great prominence in recent years owing to the raising of a number of colour varieties, which at the present time amount to some eighteen pure strains.

The wild bird is found all over Australia, and is of a yellowish-green colour. About 1870 a breeder in Holland raised a yellow bird from which a strain was developed. Some ten years later a blue Budgerigar was bred, also in Holland, but it died before any mating took place. Later this blue colour was resuscitated and, when the variety was firmly established, it immediately sprang into prominence. By mating Blues, Greens, and Yellows, other colour varieties have been created, and so great was the demand for these that in 1927 a pair of Sky Blues were valued at £125, and a pair of Cobalts at £175.

In a chapter devoted to "Colour Varieties and their Production," Mr. Cayley explains fully how these different colour varieties have been bred. As Professor Dakin points out in his introduction: "Dr. H. Duncker has investigated the inheritance of colour in Budgerigars, and, as was to be expected, his results fit in well with the Mendelian theory, but the explanations are not by any means so simple."

Mr. Cayley has given an excellent chapter on the Budgerigar in its wild state, and there are others on its care in captivity, breeding, and diseases. Anyone interested in the breeding of this bird cannot do better than study Mr. Cayley's book, in which he will find a mine of information. There are six admirable coloured plates by the author showing the different varieties and a number of diagrams, also black-and-white plates. N. B. KINNEAR.

The Naturalist on the Prowl. By FRANCES PITT. Pp. x + 137, with 33 plates. (London: Country Life Ltd. 1934. 5*s.*)

MISS PITT is an observant field naturalist and a good nature photographer, besides being the author of numerous nature books and a contributor of articles in the daily press. She has been requested by many of her readers "for hints

on how to see, watch, study and photograph wild birds and beasts," and in the present book has tried to answer these questions.

The first eight chapters are devoted to explaining how to observe animals in the field, what kind of camera to use, and the correct type of hide. All this information should be of much assistance to the novice.

The rest of the book consists of experiences which Miss Pitt has had in watching and photographing birds. She describes how Blackcock, at an early morning tournament, allowed her to drive her car quite close without causing them to stop their antics, but when she tried to get out of the motor the birds were off. Another chapter tells of a hunt on the Grampians for a Dotterel's nest; and there is an interesting account of the author's experience in photographing a Greylag Goose on its nest, which convinced her that a sense of smell must be well developed in that bird.

In the final chapter she impresses on all photographers the need of keeping careful notes of their observations, and also warns them to disturb the birds as little as possible. Harm has been done at different times by over-zealous photographers causing birds to desert their nests. The book is copiously illustrated with a number of the author's beautiful photographs.

N. B. Kinnear.

Parc National Albert. Nationaal Park Albert. Pp. 61, with 16 illustrations and 2 maps. (21 Rue Montoyer, Brussels, 1934.)

In this little brochure in the two official languages of Belgium, French and Flemish, is given a brief illustrated account of the well-known nature reserve in the Belgian Congo, which was named after the late King of the Belgians, to whose inspiration and support its inception and development are largely due. Although the first reserves in the Congo were created as far back as 1889 by the then King, Leopold II, the great reserve in the Kivu district was established only nine years ago, in 1925. The Council administering the Park is international in character, and includes the following eminent persons in other countries who have played a leading part in nature preservation: Lord Onslow, Prof. H. Humbert, Dr. E. Lönnberg, Dr. J. C. Merriam, Dr. H. F. Osborn, and Mr. P. G. van Tienhoven. The speech delivered by the present King, Leopold III, then Duke of Brabant, to the African Society in London on November 13, 1933, on the occasion of the International Conference for the Protection of Nature, is given, though in translation, as it was spoken in English. It is stated that the Park Council is shortly to issue scientific publications.

G. F. Herbert Smith.

Nonsuch, Land of Water. By William Beebe. Pp. xv + 245, with a coloured frontispiece and 55 illustrations on 46 plates. (London and New York: Putnams. 1934. 7*s*. 6*d*.)

The present volume is a cheaper reissue of a book which was first published in this country in October 1932.

Dr. Beebe is the Director of the Department of Tropical Research of the New York Zoological Society, and is the leader of an expedition which has for several years had its headquarters on Nonsuch Island, Bermuda. This book deals with the animals and plants of the island itself, as well as with the creatures found on the shores between the tide-marks and in the shallow waters of the sea; the inhabitants of the deeper layers of the ocean are to form the subject of a later volume. Commencing with a chapter on the origin of the island itself, Dr. Beebe touches upon its weather, its cedar-trees and other indigenous plants, its migratory birds, and describes such diverse animals as

flying-fish, sharks, sea-horses, flounders, snails, crabs, and jelly-fishes. His vivid and picturesque descriptions of the undersea gardens of corals, seaweeds, and sand, and his accounts of the forms and habits of the creatures dwelling among them, are certain to arouse the interest of his readers, many of whom will envy him his diving helmet and the consequent ability to wander at will in the warm shallow water and to make close acquaintance with its inhabitants.

On one page Dr. Beebe tells us that he would far rather be a poor general naturalist than a good specialist, and therein lies, one would imagine, the secret of the tremendous popularity of his books with the general reader. Constantly on the alert for fresh impressions, his mind is rarely content with conventional textbook explanations of the phenomena that he encounters. Whether he is contemplating the stunted and aged cedars growing on the exposed southerly slopes of the island, observing for the first time the curious movable turret-like eyes of the Peacock Flounder, or watching under the microscope the emergence of a flying-fish from the egg, such questions as: Why should this be ?, How has this come about ?, and When did this happen ? constantly demand an answer. His endeavours to answer these questions, and to elucidate for the benefit of his readers the problems which arise, lead him at times to explore the most remarkable and diverse avenues of reasoning, so that a number of realms of biological thought may be traversed in the course of a single chapter. An example of this will be found on page 89, where the consideration of the causes which have led to the evolution of flounders and rays lead him via the arboreal evolution of mankind to the prevalence of flat feet among policemen. Such mental acrobatics in philosophical biology are doubtless stimulating to the trained scientific mind, but to the less well-informed reader Dr. Beebe's facile and sometimes pragmatic interpretation of the processes of organic evolution may be misleading.

There can be no doubting the enthusiasm of the author for his work, and his genuine desire for others to share his knowledge and experience. It is just this enthusiasm which, in the opinion of the reviewer, makes readable a book which is written throughout in a style that is often irritating and at times really bad. Dr. Beebe is a past-master in the use of the "purple passage," and in the present book the picturesque metaphor and the curious and semi-humorous simile abound. (Who would have thought of comparing the absorption of the bar of cartilage which, in the skull of the unhatched flounder, lies in the path of the migrating eye with a galloping policeman or motor-cycle squad which speeds down an avenue, clearing it for the passage of some important personage ?) The author has deliberately planned his book so that he shall appear to the reader as a mouthpiece, and, as he himself points out, the chapters abound with I, Me, and My ! This in itself is, on the whole, an effective method, but what is to be deprecated is the frequent use of words and phrases suited more to the intelligence of children than of adults. There is a prevailing opinion that to write a popular book on natural history it is necessary to "write down" to a certain level of intelligence, which is generally supposed to be a low one. This inevitably leads to such irritating habits as referring to the "tummy" of a fish instead of to its belly or abdomen, or to the doings of a mythical personage known variously as "Nature," "Mother Nature," "Dame Nature," and so on. In spite of these faults, the book is packed with interesting facts, and the reader who has the patience to disinter them from the mass of picturesque verbiage with which they are surrounded will not be disappointed.

The illustrations, many of them from the brush or pen of members of the expedition, are excellent. J. R. Norman.

Bunyips and Billabongs. An Australian out of doors. By CHARLES FENNER, with a Foreword by FREDERICK WOOD JONES, F.R.S. Pp. xvi + 241, with one plate and numerous text-figures. (Sydney: Angus & Robertson, Limited, 1933. 6*s.*)

THE division of this book into chapters suggests a homogeneity of content which does not exist. In fact the author has brought together in book form nine articles on divers and disconnected subjects which were originally published mostly under the pseudonym of "Tellurian" in the columns of the *Australian* newspaper. The two words in the title are explained in the first and third chapters respectively. Bunyip is a mysterious animal that figures in Australian folk-lore, and billabong is the aboriginal term for the meandering streams characteristic of alluvial plains.

The topics considered range from life in the remote past to life of to-day and from the face of the earth as it is now to stellar fragments, in all of which the author shows himself at home. His style is easy and fluent, and the reader's interest is easily maintained. The author's son, Lyell Fenner, is responsible for the figures that are reproduced in the text.

Prof. Wood Jones in the pleasant foreword which he has contributed to the book says that he looks to such books to awaken the young Australian to an appreciation of the natural marvels of his homeland and to a desire to protect its fauna and flora. G. F. HERBERT SMITH.

MUSEUM NEWS.

Dr. W. T. Calman, D.Sc., F.R.S., Keeper of Zoology, has been elected President of the Linnean Society.

Mr. M. A. C. Hinton, Deputy Keeper, Department of Zoology, has been elected a Fellow of the Royal Society (F.R.S.).

Mr. J. R. Norman, Assistant Keeper, Department of Zoology, has been awarded a silver medal by the Société National d'Acclimatation de France for his work on fishes.

Among those honoured by the King in connexion with his birthday were: Dr. L. J. Spencer, Sc.D., F.R.S., Keeper of Mineralogy, who was made a Companion of the Order of the British Empire (C.B.E.); and Miss A. Lorrain Smith, Scientific Worker, Department of Botany, who was made an Officer of the same Order (O.B.E.).

In connexion with the Jubilee celebration of the La Plata Museum in September next the Director, Dr. C. Tate Regan, D.Sc., F.R.S., has been elected an académico honorario by the Council of the University of La Plata.

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On July 10 the Delegates to the Eighth International Ornithological Congress were received in the Whale Hall by the Right Honourable the Earl of Crawford and Balcarres, K.T., on behalf of the Trustees of the British Museum.

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The Winter series of Special Lectures on Monday mornings will begin in October, the arrangements for that month being :—

1. Dr. C. Tate Regan, F.R.S.: Salmon and Trout.
8. Capt. Guy Dollman: The Evolution of the Horse.
15. Mr. R. Akroyd: The Home of the Eastern Gorilla.
22. Mr. J. Ramsbottom, O.B.E.: Mushrooms and Toadstools.

The lectures will be delivered in the Board Room.

ACQUISITIONS.

Department of Zoology.

Mounted head of a cow of the Chartley breed of cattle; presented by Mrs. Charles Buckley and Mr. Godfrey R. Buckley.

A small collection of Ungulate heads from Somaliland, containing two examples of Dibatag or Clarke's Gazelle, some good Oryx (Beisa) skulls, and two fine specimens of Soemmerring's Gazelle; presented by Col. H. McMicking.

Thirteen skulls with horns of ungulates from north India, shot by the donor; presented by Lieut.-Col. H. R. P. Dickson.

Skulls of a gorilla and two chimpanzees, from Nigeria; presented by Mr. G. M. de L. Dayrell.

Mounted specimen of British Angora rabbit; presented by Hon. Ivo F. Byng.

Specimen of a White Beveren Rabbit, bred by the donor; presented by Miss Ruth H. Blackiston on behalf of the National Beveren Club.

Collection of skulls of mammals, chiefly ungulates, from Uganda and the Sudan; presented by Col. and Mrs. Martin.

An Asiatic Pangolin, or Scaly Anteater, from Upper Burma; presented by Mr. R. J. H. Kaulback.

Female specimen of a rare Howling Monkey, *Alouatta ursina*, from Brazil; presented by the Rowland Ward Trustees.

A valuable collection of mammals, including a large series of duikers and some specimens of the giant forest hog; received from Mr. G. Foster, Assistant Game Warden of Uganda.

Specimens of Russian mammals, including some of the genera, Dipus, Spalax, Citellus, Ochotona, Alactagulus, and Cricetulus; received by exchange from the Moscow Museum.

A quantity of vegetation for the Gorilla Group, collected during a trip for the purpose, from the Birunga Mountains, Uganda; received from Mr. R. Akroyd.

Department of Entomology.

Collection of over 8000 insects of various kinds, principally small bees and wasps, formed by the donor in South Africa; presented by Mr. R. E. Turner.

Collection of over 40,000 specimens made by Miss L. E. Cheesman, when exploring the mountains of New Guinea.

Collection of over 300,000 butterflies and moths, including 3000 types, from the J. J. Joicey Collection; presented by the Trustees of the estate of the late Mrs. Mary Joicey.

Collection of about 3000 insects (including 1450 Diptera, 1300 butterflies, and 130 dragon-flies) from India, mostly from Quetta, Deesa, and Jubbulpore; bequeathed by the late Lieut.-Col. C. G. Nurse.

Donisthorpe collection of British Coleoptera, consisting of over 20,000 specimens and of especial interest because it is accompanied by the most complete set in existence of the numerous British insects, mainly beetles, and other arthropods which live in association with ants and are known as myrmecophiles; purchased.

Collection, numbering 352 specimens, of beetles found inhabiting ants' nests by Mr. W. du Boulay in various parts of Australia over a period of sixteen years; purchased.

Department of Geology.

Small portions of the egg shell of a small horned dinosaur, *Protoceratops andrewsi*, collected by the American Museum Central Asiatic Expedition in 1923–24; presented by Miss M. Graves, M.P.

A very large and well preserved specimen of the ammonite, *Coroniceras*

bucklandi, collected from the Lower Lias of Lyme Regis, measuring over 2 feet in diameter and weighing nearly 3 cwt.; presented by Mr. C. S. M. Bompas.

Skull of a child, about six years old, discovered by Miss Garrod in 1926 in a cave near Devil's Tower, Gibraltar, where the first, the famous "Gibraltar Skull" was discovered in 1848; presented by the Trustees of the Percy Sladen Fund.

Department of Mineralogy.

An end slice of a large mass, weighing 2520 lb., of the meteoric iron found in 1909 at Murnpeowie, South Australia; presented by the Council of the South Australian School of Mines and Industries.

Fine crystallized specimens of hopeite and tarbuttite; presented by the High Commissioner for Southern Rhodesia.

Series of crystals of cerussite and celestine from various localities in Tunisia; presented by Dr. Marcel Solignac.

Large blocks of long-fibre satin-spar (gypsum), from East Bridgford, Nottinghamshire; presented by Mrs. A. Coville.

Isolated crystals of native gold from the alluvial deposits on the Muti stream, Buhwezhu County, Uganda; presented by Mr. Michael Moses, M.B.E.

Lusakite, a new mineral composed of cobalt and aluminium silicate, from 80 miles east of Lusaka, Northern Rhodesia; presented by Mr. A. C. Skerl.

Bismuth tungstate, a new mineral from Cornwall; presented by Mr. E. H. Davison.

Series of specimens representing Canadian occurrences, including a large crystal of lepidomelane, large polished slices of sodalite-syenite, chrysolite, galena, and porphyry, and rough and carved pieces of rose-quartz; received by exchange.

474 pieces of meteoric iron, with a total weight of 165½ lb. (75·3 kg.) from the meteoric craters at Henbury, Central Australia; received by exchange from Kyancutta Museum, South Australia.

Series of minerals from pegmatite veins in Maine, U.S.A., including large crystals of amblygonite, columbite, multi-coloured crystals of tourmaline, and a faceted specimen of pollucite (a new gemstone); purchased.

A remarkable euclase crystal from a mica mine in Morogoro district, Tanganyika Territory; purchased.

Department of Botany.

A further fourteen specimens of Nepal plants, collected by Prof. K. Sharma and presented by the Maharajah of Nepal to His Majesty; lent by His Majesty the King.

Collection of 534 specimens of flowering plants gathered in Bhutan by Mr. F. Ludlow and Capt. G. Sherriff; presented by the Trustees of the Godman Exploration Fund.

Sixty-three bundles of plants, which were presumably given to the Hancock Museum by William Robertson, who bought them at the sale in 1842 of A. B. Lambert's herbarium, one of the largest privately owned; presented by the authorities of the Hancock Museum, Newcastle-upon-Tyne.

Large collection of plants made during an expedition to Tibet in 1933; presented by Capt. F. Kingdon Ward.

Herbarium of about 5000 sheets of flowering plants, chiefly from Europe, but also from Algeria, Cape Colony, and the Canary Islands; bequeathed by the late Mr. Ashley H. Maude.

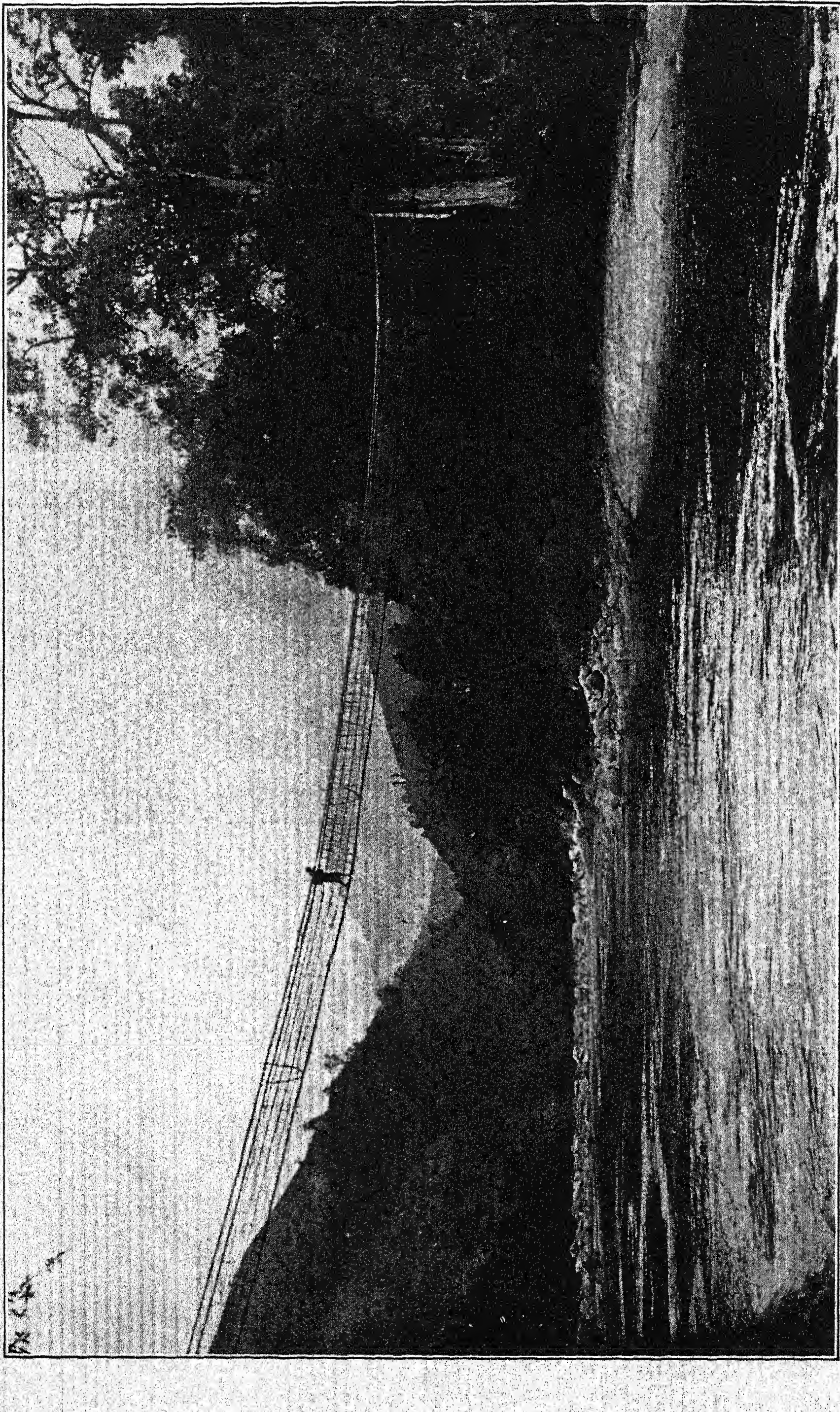
Valuable set of plants of San Thomé and Principe; received in exchange from the University of Portugal.

1423 specimens of Rhododendron; received in exchange from the Royal Botanic Gardens, Edinburgh.

Photograph by courtesy of Capt. F. Kingdon-Ward.

LISU WOMAN.

The Lisu tribe is one of those of western China which are gradually migrating into the Irrawaddy jungles in far northern Burma. The headdress is of cowrie shells.



Photograph by courtesy of Capt. F. Kingdon-Ward.

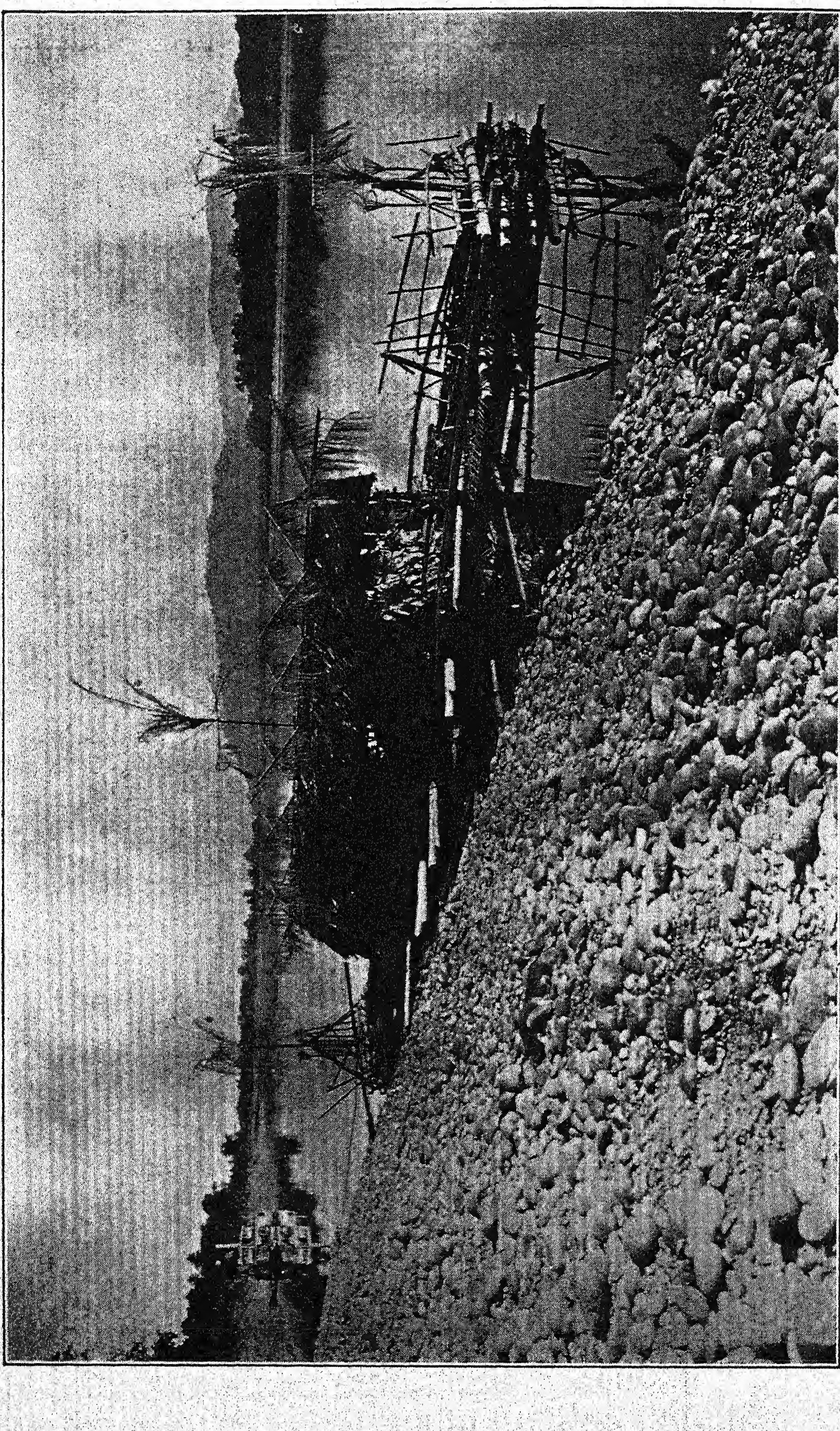
CANE SUSPENSION BRIDGE.

This bridge is at the headwaters of the Irrawaddy in the Maru country. It is made of cane (*Calamus* species) with ties of bamboo.

Photograph by courtesy of Capt. F. Kingdon-Ward.

MARU HUT ON THE UPPER IRRAWADDY, BURMA.

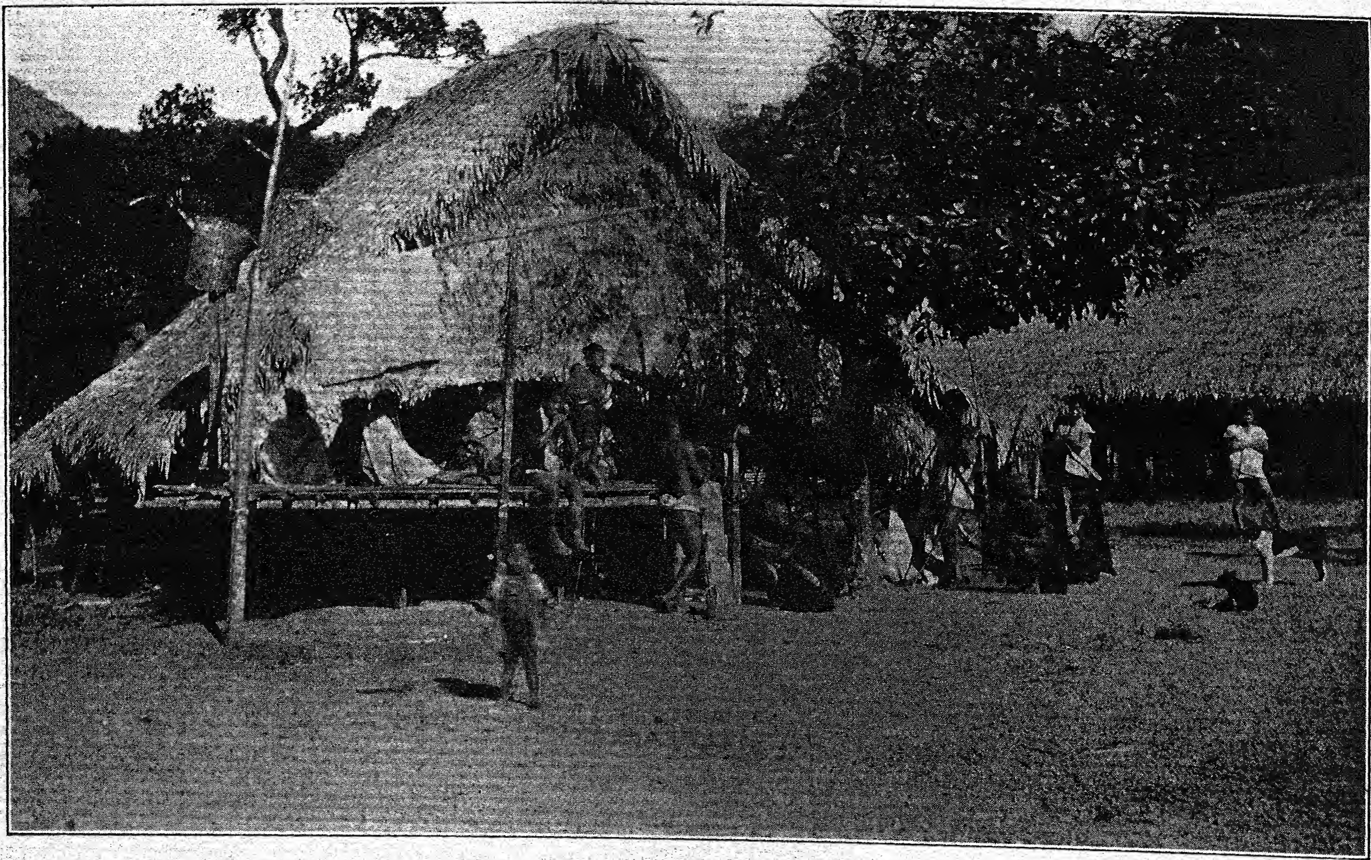
Many of the valleys along the Burma–China frontier are occupied by the Maru tribe, which is closely related to the Kachin tribe, the largest and most powerful of the north Burma tribes.



Photograph by courtesy of Capt. F. Kingdon-Ward.

KACHIN BAMBOO RAFT ON THE IRRAWADDY, ABOUT 1000 MILES FROM THE SEA.

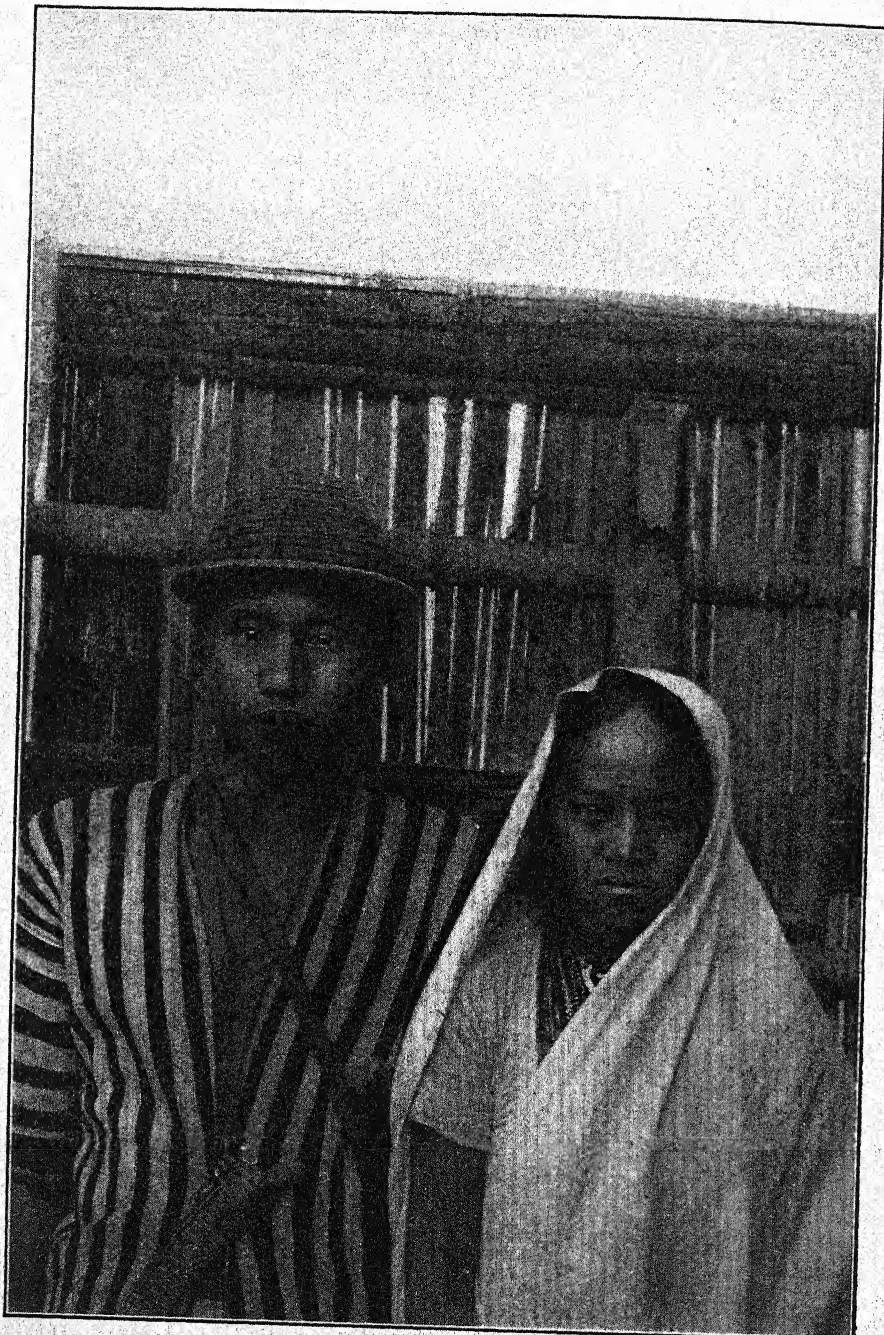
These rafts are built higher up the river and floated down to Myitkyina, the head of steam navigation, where they are broken up and sold. The plume-like decorations are to keep off evil spirits.



Photograph by courtesy of Capt. F. Kingdon-Ward.

ABOR HUT.

This hut is on the Assam frontier. The Abors inhabit the valley of the Dihang (the main tributary of the Brahmaputra). They are one of the most dangerous tribes on the Indian north-east frontier, and are always fighting.



Photograph by courtesy of Capt. F. Kingdon-Ward.

ABOR WARRIOR AND WIFE.

He wears a helmet of finely woven cane as a protection.

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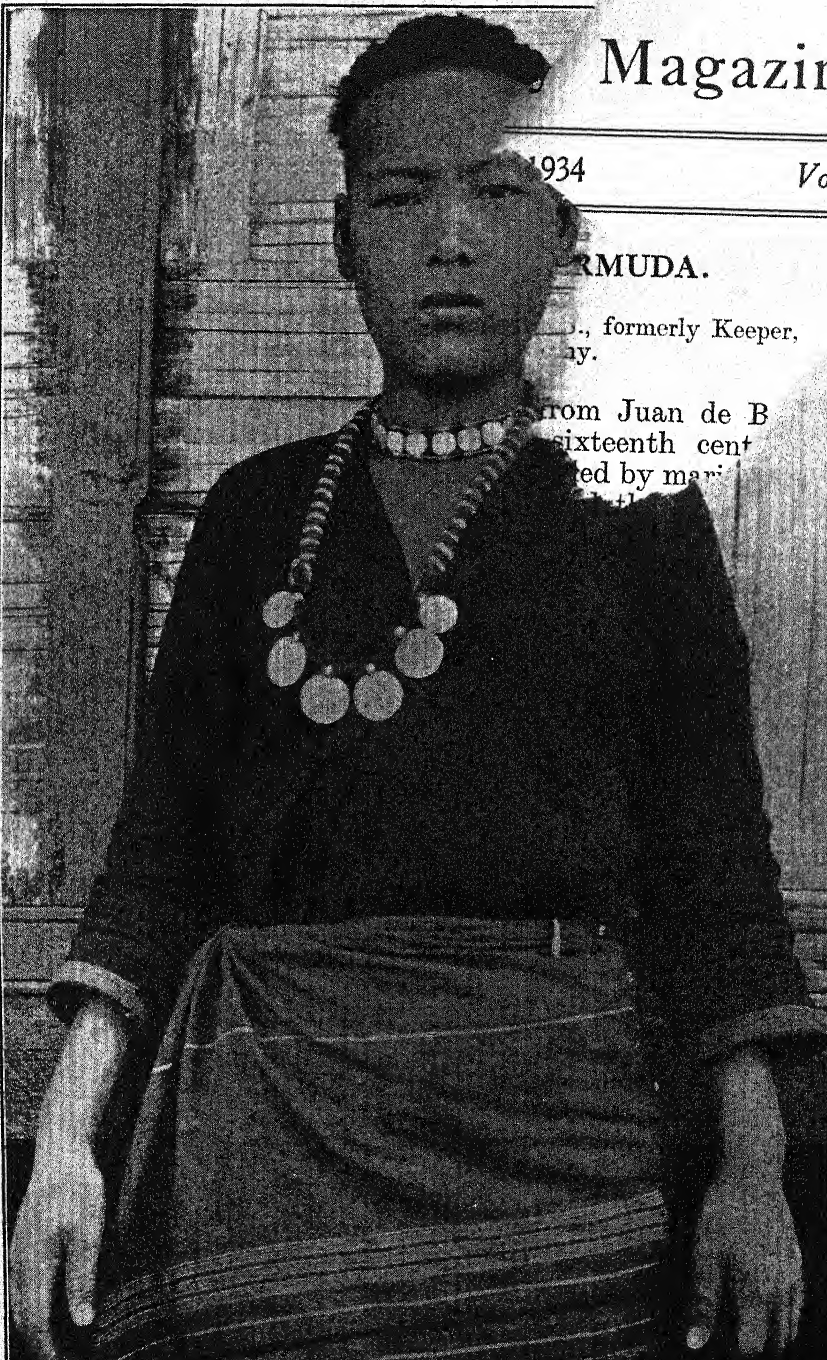
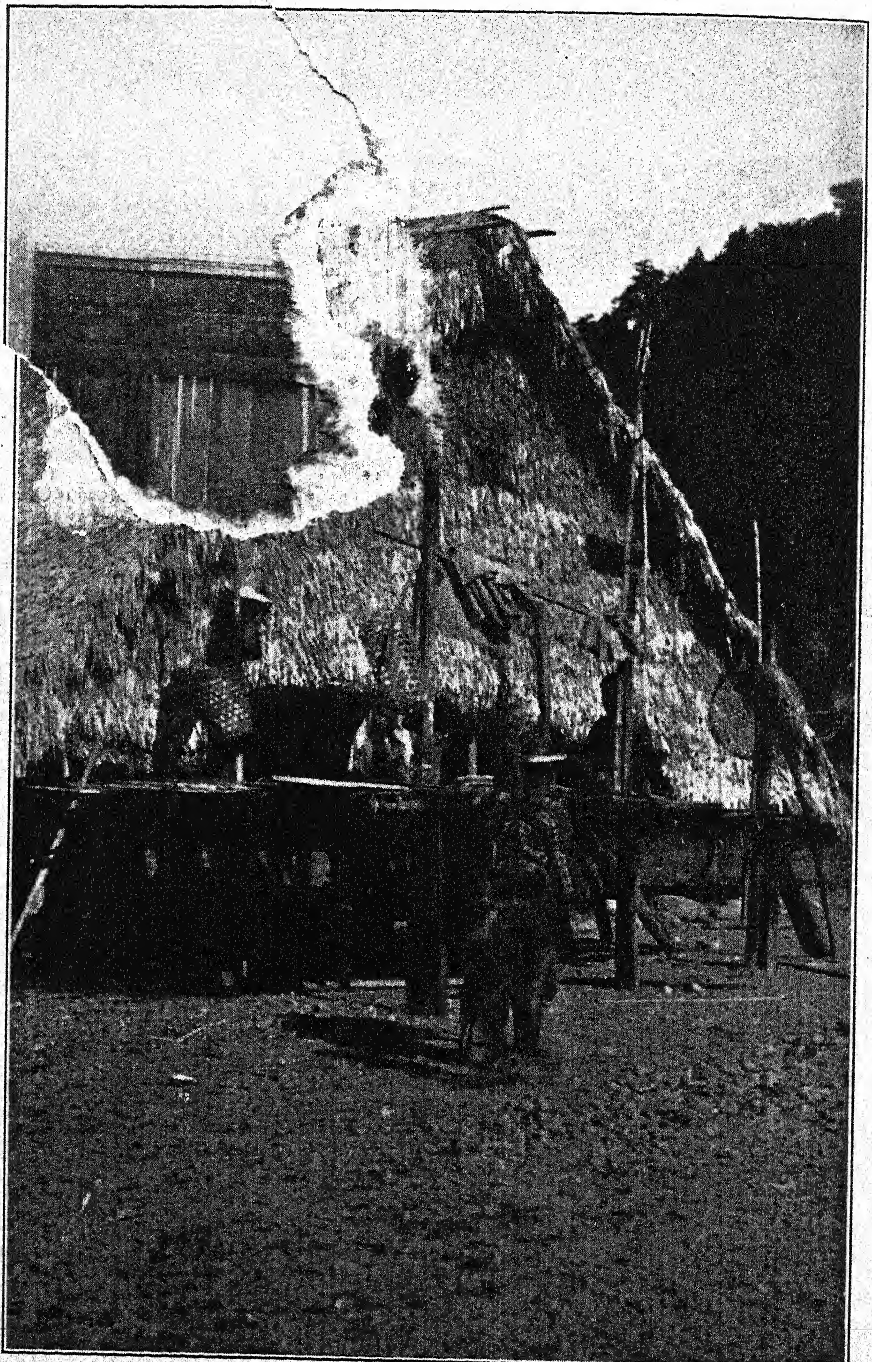


Photograph by courtesy of Capt. F. Kingdon-Ward.

Abor Unmarried Girl.

Her hair is cropped. To her bead necklaces she has added a few hard-earned rupees and half-rupees.



Photograph by courtesy of Capt. F. Kingdon-Ward.

ABOR HUT.

This hut is built on piles of timber and bamboo, and thatched with grass.

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A BOTANIST IN BERMUDA.

By A. B. Rendle, M.A., D.Sc., F.R.S., formerly Keeper, Department of Botany.

The Bermudas take their name from Juan de Bermudez, who discovered them early in the sixteenth century. The islands were uninhabited, and were dreaded by mariners because of the dangerous reefs which surrounded them and the gales to which they were subjected.

An inscription, "T.F. 1543," carved on Spanish Rock on the South Shore is supposed to recall the visit of a Spaniard, Theodore Ferdinando Camelo, who attempted a settlement on behalf of Philip II of Spain, of the outcome of which there is no record. In 1609 Admiral Sir George Somers, on a voyage from England to carry aid to the struggling settlement in Virginia, was wrecked near what is now St. George's. His party remained on the islands for nearly a year, and then resumed their voyage to Virginia in two pinnaces built from the native "Cedar." Somers returned to the Bermudas to secure a cargo of the fish, hogs (perhaps introduced by Camelo), and fowl which abounded, but died shortly after his arrival. The islands were definitely colonized by the Virginia Company in 1612 and have ever since been a British possession. There is much of interest in the vicissitudes of their subsequent history.

The Bermudas of to-day are the remains of a cap of æolian limestone topping a submarine mountain of volcanic origin. The present land area, a little over nineteen square miles in extent, consists of a main island, with an average breadth of a mile and a half, continued east and west by a few smaller islands connected by bridges, and also numerous small islands. Local gossip puts the total number at 365. The group is shaped like a fish-hook; the curved portion at the east end encircles the Great Sound, at the top of which is the capital, Hamilton, with its harbour. The eastern half of the mainland includes two large pieces of water, Harrington Sound, almost land-locked, and Castle Harbour. At the extreme end

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is St. George's Harbour with the quaint old capital, St. George's, the original settlement; the approach to this from the sea is too narrow for the passage of large vessels.

The group of islands is protected by a reef in the form of an ellipse. On the south the reef hugs the shore; on the north it is from six to eleven miles out and the sea between is a medley of rocks and shoals, the approach through which by the ship channel to Hamilton Harbour requires very careful navigation. Beyond the north reef the submerged slope is very steep, falling 1250 fathoms in six miles. On the south it is less steep; but the group is completely isolated, separated by abysses of ocean from any other land. The nearest land is Cape Hatteras, about 570 miles to the west; the Bahamas are about 700 miles to the south-west. The Bermudas have no connexion, political or otherwise, with the West Indies, and Bermudians resent the addition of B.W.I. (British West Indies) to their address. The Gulf Stream flows between the islands and the American coast and curves north-east above them, thus ameliorating the north-east winds and ensuring a mild winter.

The volcanic origin of the islands was definitely established in 1914 by a boring 1400 feet deep in search of water. This revealed a depth of the characteristic limestone of 360 feet; below this were 200 feet of soft yellowish to brown clay-like rocks of more or less decomposed volcanic tufa, and beneath this blackish to grey compact volcanic rock, an augite–andesite lava, which continued unchanged for the remaining 800 feet. No water was found. On the original volcanic mass, the formation of which geologists assign to the close of the Triassic period, extensive reefs of coral and deposits of shell-sand were formed during the period of erosion that followed, with greater or smaller oscillations of level. In Pliocene times the reefs and shoals were gradually upraised until practically much of the whole area now enclosed by the reefs was dry land. This greater Bermuda had probably an area of some 230 square miles. The highest elevation reached by the sand-dunes is estimated at 450 feet. They were built up of shells, remains of calcareous algæ, and other organisms, and their formation represents a vast lapse of time. The flora of greater Bermuda in Pliocene times, with a warmer and moister climate than at present, was probably far more luxurious.

Present-day Bermuda is the result of a gradual subsidence, evidence of which is found in the submerged stalagmites in the underground caves, which may rise through thirty feet of water, the thick beds of peat in the low-lying marshes, and the

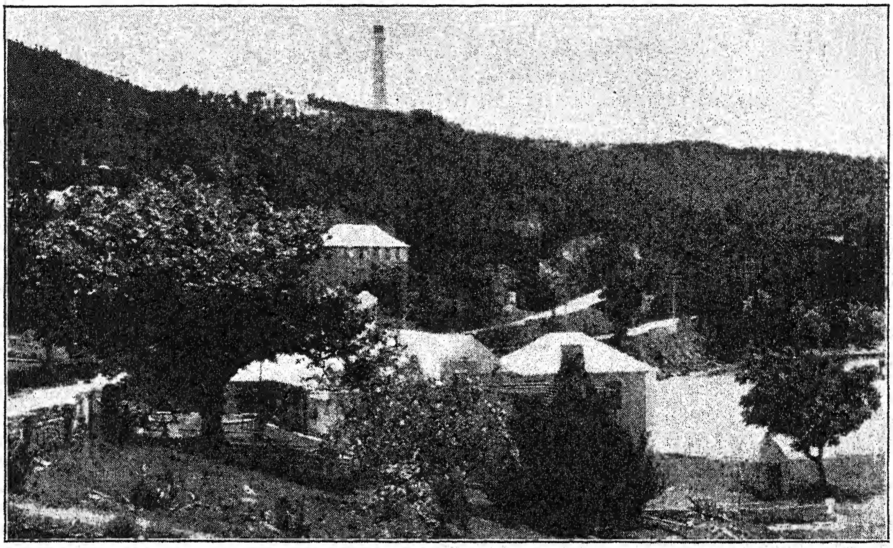

FIG. 1.—GIBBS HILL, THE HIGHEST POINT IN THE ISLANDS, WITH THE LIGHTHOUSE.

The hill-slopes are covered with the native " Cedar." The house standing by the creek below the road is one of the oldest in the islands; the " buttery " is visible in right-hand corner. The tree in front of the house is a pomegranate.

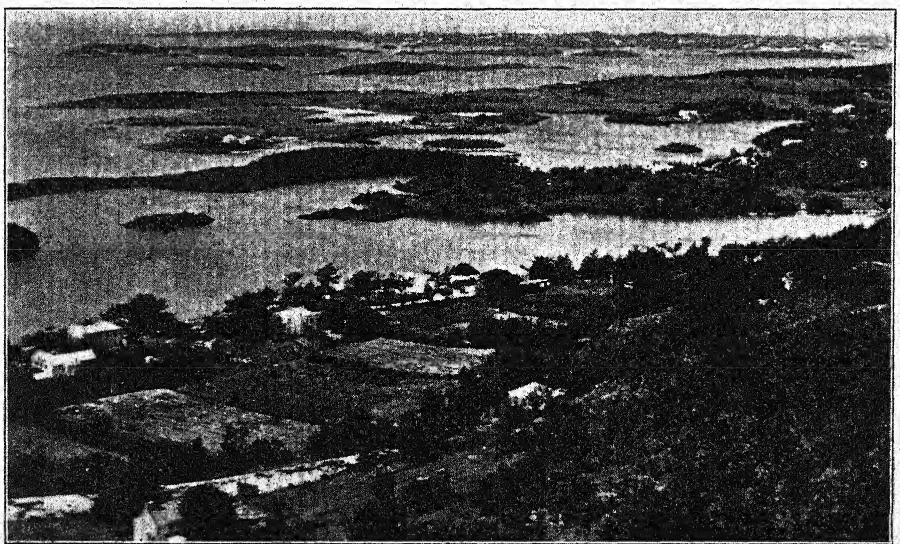

FIG. 2.—VIEW FROM GIBBS HILL LIGHTHOUSE, GREAT SOUND.

The low, rounded, dune-like character of the hills on the islands and on the mainland across the Sound all clothed with " Cedar " may be noted. At the foot of the hill the ground has been cleared for cultivation of vegetables.

vertical stumps of "Cedar," which were found in a peat-bed forty-five feet below the low-water mark off the Naval Station in Ireland Island.

Nearly all the rocks, both above sea-level and to a considerable depth below it, are formed of wind-drifted shell-sand with a small percentage of material derived from corals, coralline algæ, foraminifera, bryozoa, etc., which have become so infiltrated with calcite as to obscure their original sand-drift origin. The islands consist of low rounded hills up to about 250 feet elevation, covered with the native "Cedar"—a species of Juniper (*Juniperus bermudiana*)—and intersected by winding valleys, the roads along which supply ample means of communication. The absence of motors, which are tabooed, renders travel pleasant through the shady valley roads, sometimes deeply cut through the limestone or following the seashore or the inland sounds, with views of the turquoise-blue water, a pleasing contrast with the somewhat sombre general tone of the "Cedars." The white houses, with walls and roofs of the native stone, add to the general effect (Figs. 1–4).

The old Bermudians built their houses as they did their ships—for many years they held the carrying trade between North America and the West Indies—of the Juniper, which yields a timber, of uniform grain and warm brown colour, which takes a good polish. Then it was realized that an inexhaustible supply of building material lay just beneath the soil, and houses were built of the native limestone, which may be sawn as easily as wood but hardens on exposure. Tiles for the roof are made by slicing the blocks into slabs (Fig. 5). There being no streams or wells in the island, water-supply depends on rainfall and the roof forms the catchment area. Old houses may be recognized by two appendages: the square stone water-tank with a dome-shaped roof, the air in which kept the water cool, and the conical "buttery" (Fig. 1) to keep the food fresh, which antedated the modern refrigerator. Tanks are now generally built underground, and large houses often have an independent catchment area. The average yearly rainfall is 57 inches: the three summer months are the wettest, but there is no rainy season. Frost and snow are unknown; the daily mean temperature varies from 63° in January and February to about 80° in July, August, and September. Continuous rain is unusual; heavy showers are followed by bright sunshine, and, owing to the porous nature of the soil, the ground dries very quickly. The wealthy American, who represents the staple industry of the islands, may exchange the rigours

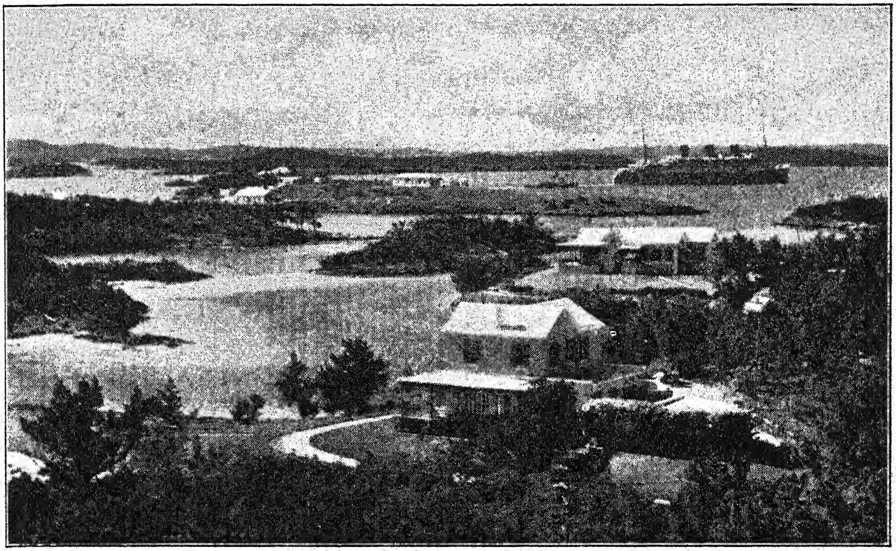

FIG. 3.—VIEW OF GREAT SOUND, NORTH OF HAMILTON.
The low building on Agar's Island (centre background) was formerly a biological station.

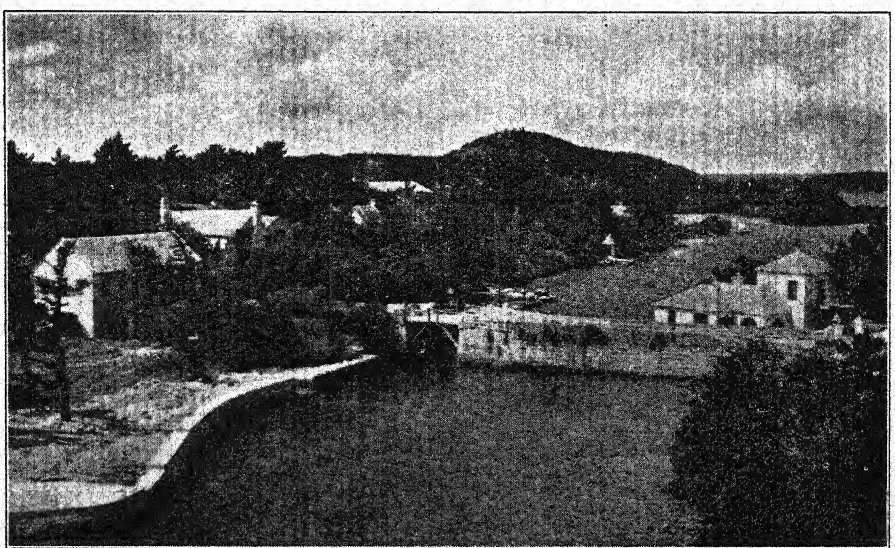

FIG. 4.—SOMERSET BRIDGE, JOINING THE MAINLAND TO SOMERSET ISLAND.
Beyond is Ely's Harbour, one of the beauty spots in the islands.

of the winter of the Eastern States for a balmy spring by a voyage from New York of barely thirty-six hours' duration. The drawbacks of the climate are the damp, sticky south winds, which may make August and September rather trying months, and the hurricanes, which occasionally visit the islands. The soil is calcareous throughout; it is thin on the hillsides, a rich-looking red in colour, slightly clayey, and varying in depth in the valleys, and black or brown in the marshes.

Owing to lack of records except in comparatively recent years, it is not always easy to distinguish between native and

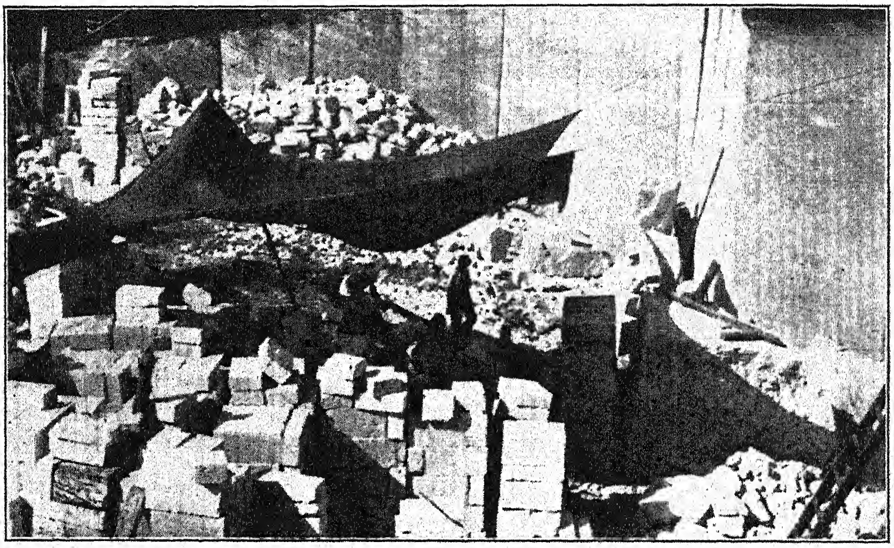

FIG. 5.—CUTTING THE NATIVE STONE IN A QUARRY FOR BUILDING PURPOSES.

introduced vegetation. A list of the wild plants at the present day would include many that were certainly not to be found before the colonization of the islands at the beginning of the seventeenth century, and many of the commonest species have undoubtedly been introduced and are displacing the original vegetation.

The general tone of the landscape is given by the Juniper (Fig. 6), a true endemic, which forms nearly pure forest on the hills and spreads to the rocky coast within reach of the salt spray. It is a shapely tree and may reach 70 feet in height in the deeper soil of the valleys (Fig. 7). These have, however, been extensively cleared for cultivation, the only industry of the islands (apart from the tourist) being the cultivation of the

Easter Lily and vegetables, which in the early months of the year fetch a good price in the American markets. The fields of Easter Lilies (*Lilium Harrisii*) are a beautiful sight in March

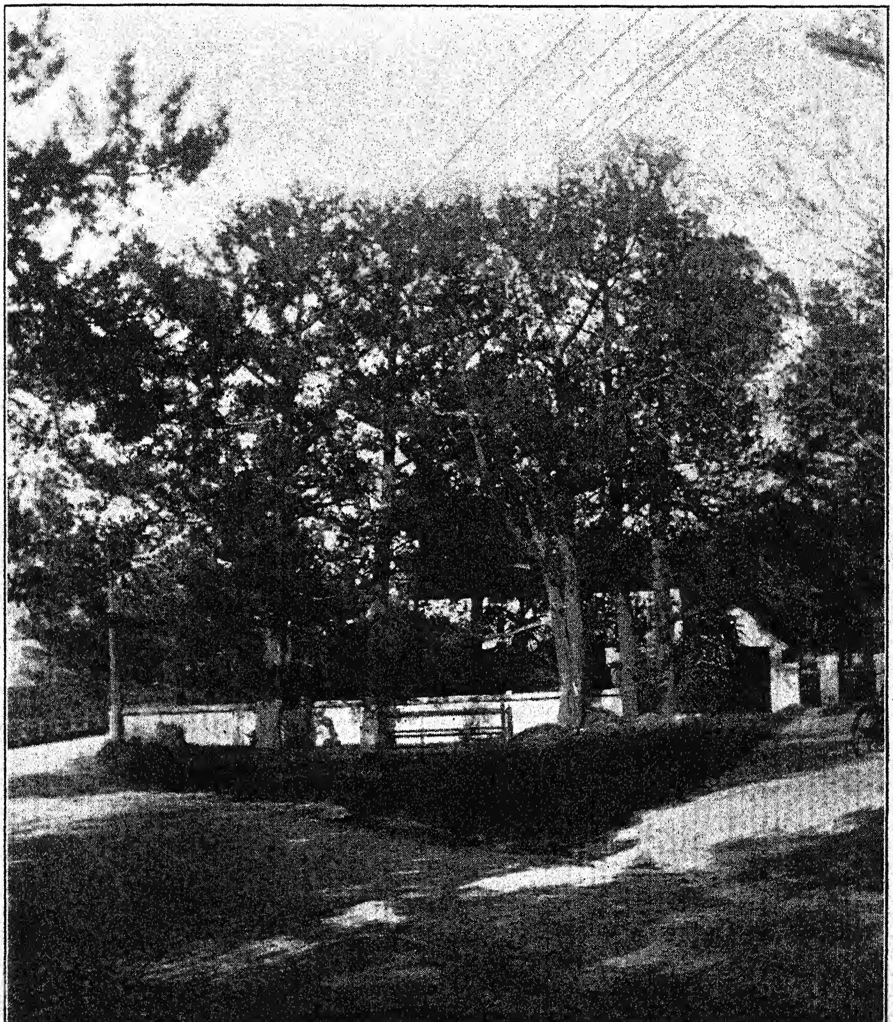

FIG. 6.—OLD JUNIPER TREES BY DEVONSHIRE CHURCH.

(Fig. 8), and there is a large export trade of the blooms and, later in the year, of the bulbs.

Shapely specimens of the Junipers may be seen in the extensive grounds which surround the often picturesque homes of the Bermudians or their American visitors. When spaced to

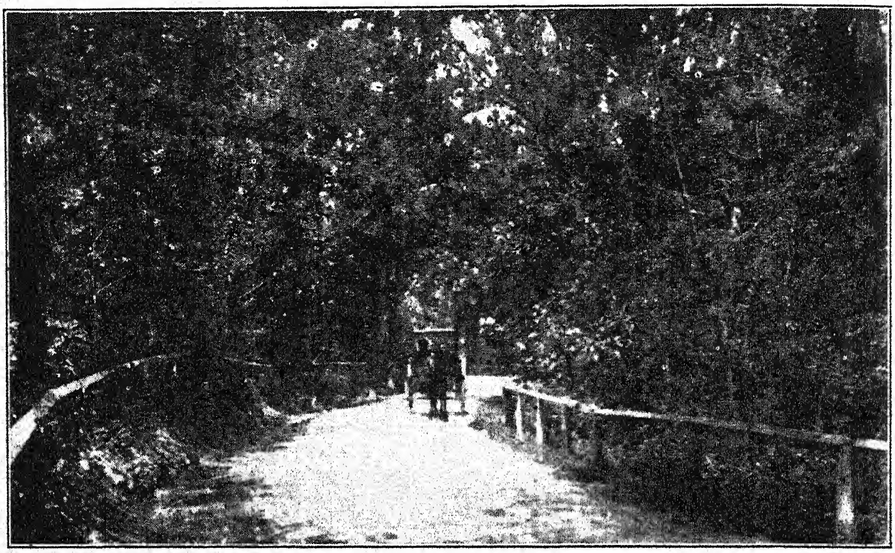

Fig. 7.—Juniper Trees beside Happy Valley Road near Hamilton.

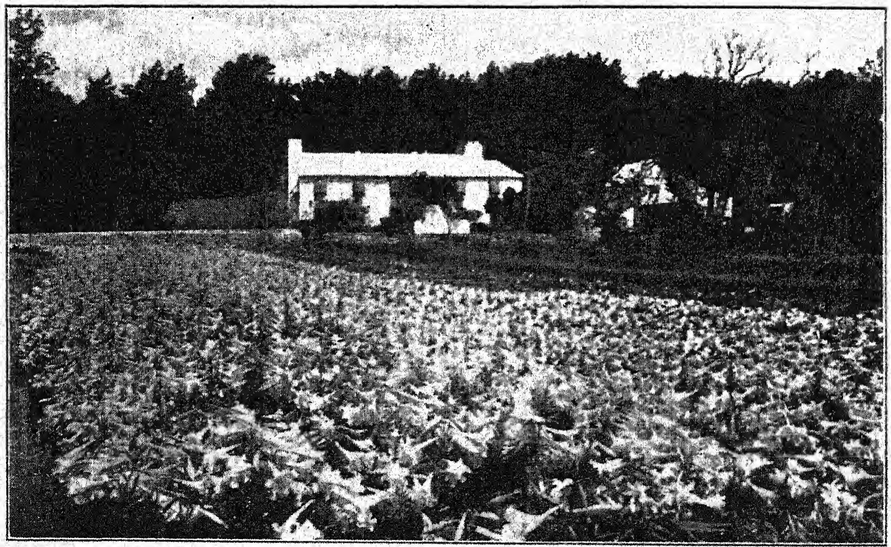

Fig. 8.—A Field of Easter Lilies.

The house shows the old style of building with the entrance on the first floor. The jalousies on the windows are a protection during hurricanes.

allow full development the trees give a charming park-like effect, the grey-brown stringy bark and the quiet green foliage contrasting with the brighter green sward of the native Crab-

FIG. 9.—VIEW ON THE SOUTH SHORE, SHOWING EFFECT OF PREVAILING WIND ON GROWTH OF JUNIPER.

grass (*Stenotaphrum*) which forms a dense, but coarse, turf and supplies the lawns for the gardens. Near the shore, especially on the South Coast where they are exposed to the prevailing winds, the Juniper shows evidence of exposure (Fig. 9), and

weird examples may be seen of trees rooting in bare rock and, where the salt spray reaches them, reduced to low straggling bushes (Fig. 10). Around Hamilton the tree is threatened by an introduction from the West Indies, the Fiddle-wood (*Citharexylum*)—a curious misreading of the original name, *bois fidèle*. Its seedlings spring up in the shelter of the Juniper; the straight rapidly growing stem branches freely and, bearing a heavy foliage, kills out the side branches of its protector,

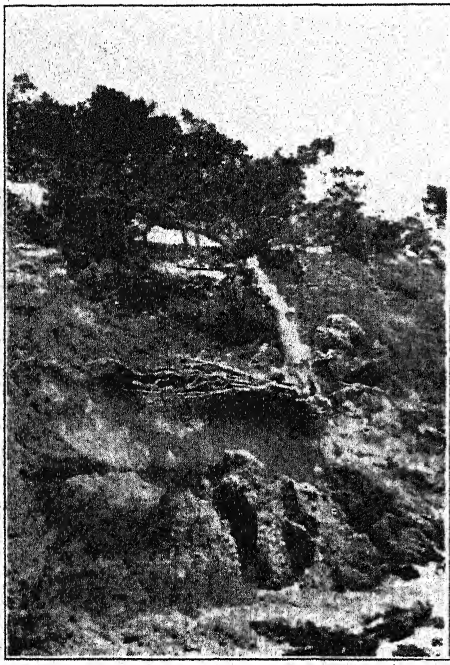

FIG. 10.—JUNIPER ROOTED IN ROCK AND SHOWING EFFECT OF PREVAILING WIND, SOUTH SHORE.

FIG. 11.—PALMETTO (*Sabal Blackburnianum*) ON HILLSIDE NEAR SOUTH SHORE.

which it will ultimately destroy. Fortunately the wood is very brittle and a high wind will snap or uproot the Fiddle-wood leaving the Juniper intact.

The shrubby undergrowth consists mainly of a "Sagebush" (*Lantana involucrata*), the most abundant shrub on the islands. Sir John Lefroy, Governor of the islands, 1872–77, who wrote on their botany, says that it was introduced from the Bahamas prior to 1800, "with the idea that it would be good for firing, which it is not," as it makes very little wood. It has every appearance of a native. With its small heads of

pale lilac or white flowers it is not an attractive plant. The Red Sage-bush (*L. Camara*), a decorative plant with cream-yellow to deep orange flowers, presumably naturalized from Florida or the West Indies, prefers more open situations.

The change wrought by alien immigrants is well illustrated in the steep rocky neck of land separating Harrington Sound from Castle Harbour. Lefroy regarded this tract as geologically older than the rest of the land area. Dr. Britton writing in 1918 remarks that " many of the native plants are now restricted to this region, presumably because it has been less modified by man than other parts of Bermuda, and also because the numerous pockets of soil in dense shade provide a suitable home for many of the rarer species." But within the last few years the Public Works Department has established a quarry for road metal—the rock here being especially hard—and a huge luxury hotel with extensive grounds has recently been erected. The small portion that remains is overrun by a vine, a species of Jasmine (*Jasminum simplicifolium*) native of Australasia, a single specimen of which was introduced in 1840. It now covers rocks, shrubs and even trees with an inextricable tangle of dense luxuriant growth. A few of the rarer endemic and other native plants still maintain a precarious existence, but it is now too late to consider the conservation of the area as a native reserve. This rocky woodland was the last refuge of the Yellow or Satin Wood, *Zanthoxylum flavum*, a tree with a beautiful hard wood which was formerly plentiful in the islands but was nearly exterminated by cutting for export to England. Felling was restricted as early as 1632. At the present day only one tree remains, which is, however, carefully preserved, in the grounds of the Castle Harbour Hotel. Several endemic or native ferns have almost or completely disappeared.

The few remaining marshes still form a refuge for the native damp-loving species. These are, however, gradually being drained and brought under cultivation. There is talk of conserving one of these, Paget Marsh, a small low-lying area between Hamilton Harbour and the south shore. Here the endemic Palm (Fig. 11), the Bermuda Palmetto (*Sabal Blackburnianum*), which is generally distributed through the islands, grows freely. Several species of ferns, the Royal Fern, and an allied species, *Osmunda cinnamomea*, a species of Bracken (*Pteris caudata*), and others luxuriate; the Wax Myrtle (*Myrica cerifera*) and the Dog-bush, a shrubby Composite (*Baccharis*), form a tall dense growth. Other damp-loving shrubs and herbs abound and the saturated ground or the damp bases of the palms and ferns

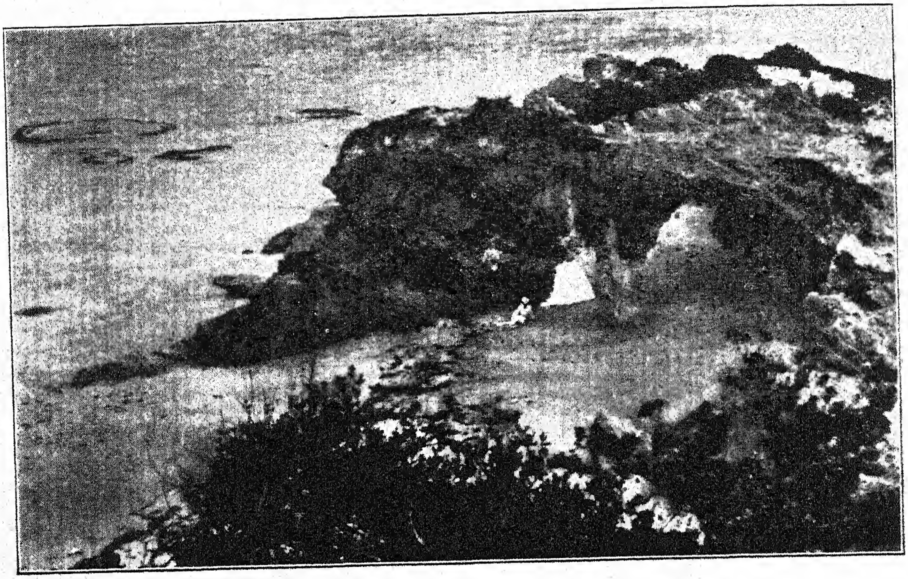

FIG. 12.—MUCH-WEATHERED ROCKS, FORMING NATURAL ARCHES, ON THE SOUTH SHORE.
Near the shore several "boilers" of the reef are exposed.

FIG. 13.—SOUTH SHORE, LOOKING TOWARDS WARWICK CAMP.
The reef is visible just off the shore.

bear species of moss and liverwort. I was pleased to find here several patches of the endemic sedge, *Carex bermudiana*, which was supposed to be extinct. The marsh is private property, but it is hoped that some means may be found to stop encroaching cultivation and preserve an interesting record of the original flora.

The coast-line, especially on the south shore, is a succession of bays sheltered by much-weathered rocky cliffs, often assuming remarkable and fantastic shapes (Fig. 12), or bounded by

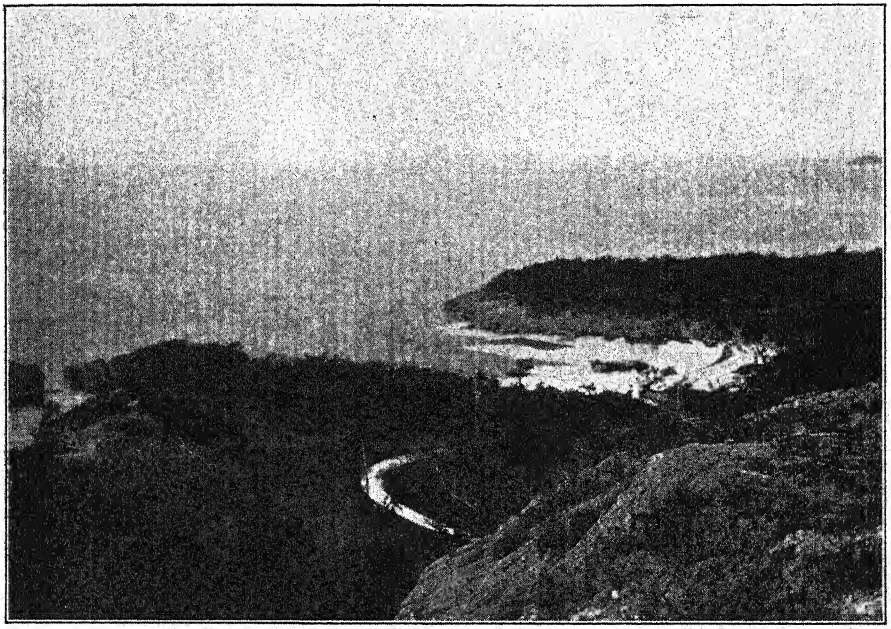

Fig. 14.—View from Wreck Hill, near Ely's Harbour, South Shore.

low sand-dunes. The beaches, of white or pink-white sand, form admirable bathing places (Figs. 13, 14). The shore retains much of the native vegetation. Fine clumps of the native Sea-Lavender (*Tournefortia gnaphalodes*) (Fig. 15) with silky grey-green foliage, the yellow-flowered Sea Ox-eye (*Borrichia arborescens*), and the Tassel-plant (*Suriana*), with slender, softly hairy, tasselled foliage, cling to the rocks or clothe the dunes. The Beach Lobelia (*Scaevola*) with flat spoon-shaped leaves and plum-like fruit forms untidy straggling bushes. The Buttonwood (*Conocarpus*), which in sheltered places, especially in swampy ground, forms a tree, has a prostrate habit on the windswept coast, the gnarled and twisted stem and branches sprawl-

ing over a considerable area. Spiky clumps of Spanish Bayonet (*Yucca aloifolia*) (Fig. 16) flourish on the dunes; and a low-growing Prickly Pear (*Opuntia Dillenii*) forms spiny colonies on sandy (Fig. 17) or rocky soil. A characteristic shrub or small tree, especially on the south shore, is the Sea-Grape (*Coccoloba*) (Fig. 18). It has a shapely rounded habit, its fruit, resembling bunches of grapes, is edible but astringent. Its large firm roundish leaves take on a bright red colour in summer.

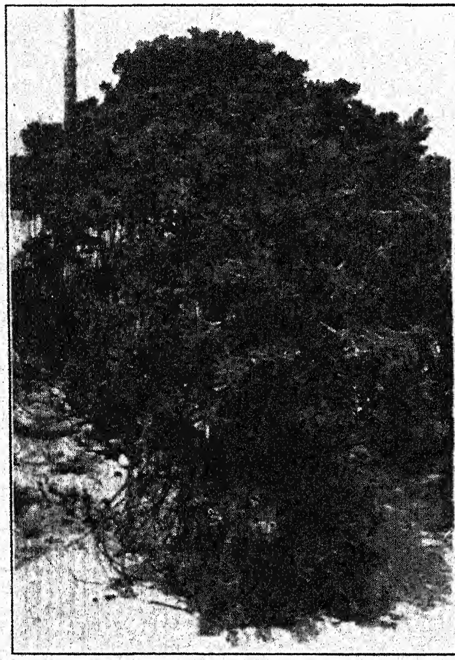

Fig. 15.—Clump of Sea Lavender (*Tournefortia gnaphalodes*), about four feet high on Sandy Beach at Warwick Bay.

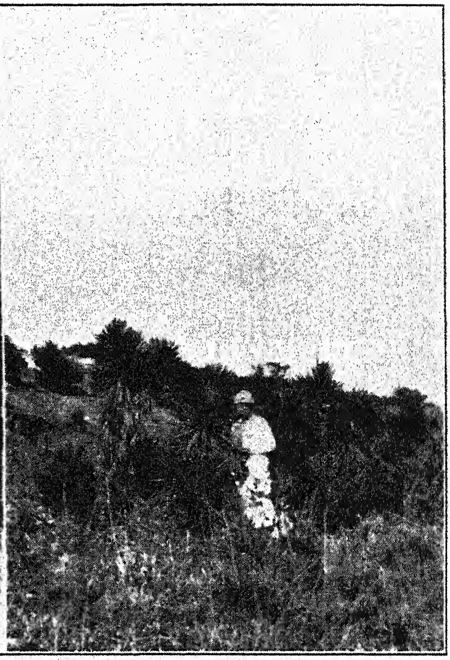

Fig. 16.—Spanish Bayonet (*Yucca aloifolia*) on Sand Dunes, Warwick Bay.

The Bermudian dislikes Mangrove swamps. They were associated with yellow fever, records of severe epidemics of which in the last century may be read on the wall-tablets and old tombstones in the quaint old church and churchyard at St. George's. Some of the swamps have been drained. One of the finest gardens in the islands at the head of Hamilton Harbour replaces a Mangrove swamp, the remains of which still form a screen at the edge of one of the pleasant lawns. But swamps still persist in sheltered low-lying creeks along the coasts. There is an extensive one at Hungry Bay on the south

shore where the typical Mangrove (*Rhizophora Mangle*) (Figs. 19, 20) drops its dart-shaped seedlings from the pendent fruit, and slender rope-like roots from its branches, into the soft mud. With it grows the Black Mangrove (*Avicennia*), distinguished by its lighter foliage and absence of aërial roots. Projecting from the mud rise the short spears of their breathing roots. A third tree, the Buttonwood, mingles its branches with these at the edge of the swamp; and on the foreshore of

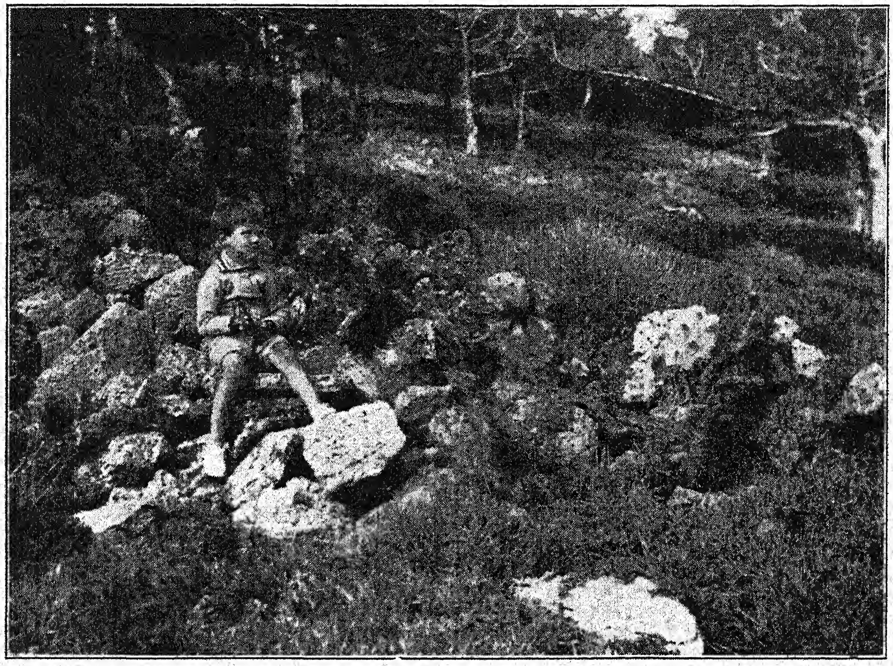

FIG. 17.—PRICKLY PEAR (*Opuntia Dillenii*) AMONG ROCKS ON CLIFF ABOVE CHURCH BAY, SOUTH SHORE.

the creeks the Glasswort (*Salicornia*) and Sea Purslane (*Sesuvium*) creep on the mud.

The herbaceous vegetation of the islands is an interesting mixture of alien and native species. The Life-plant (*Bryophyllum*), an Old World species introduced as a curiosity in 1813, is ubiquitous on walls, in woodland and on waste ground. It is a decorative plant with its tall spike of slender creamy-pink bell-flowers which are at their best in February. In Jamaica, where it is also common, it is appropriately known as 'Chinese lanterns.' It reproduces freely from leaves, stems or broken pieces of the plant. Other early flowers are a rose-

purple and a yellow Oxalis, the latter known as the Bermuda buttercup; both are aliens. In April the little Bermudiana (*Sisyrinchium Bermudiana*), the national flower, an endemic species, abundant in dry sunny places, opens its bright violet-blue star-like blooms. But there is nothing in the Bermudas to compare with the sheets of yellow, white or blue with which we are familiar in our English spring. In rocky places, on the coast and inland, a little endemic *Erigeron* (*E. Darrellianum*)

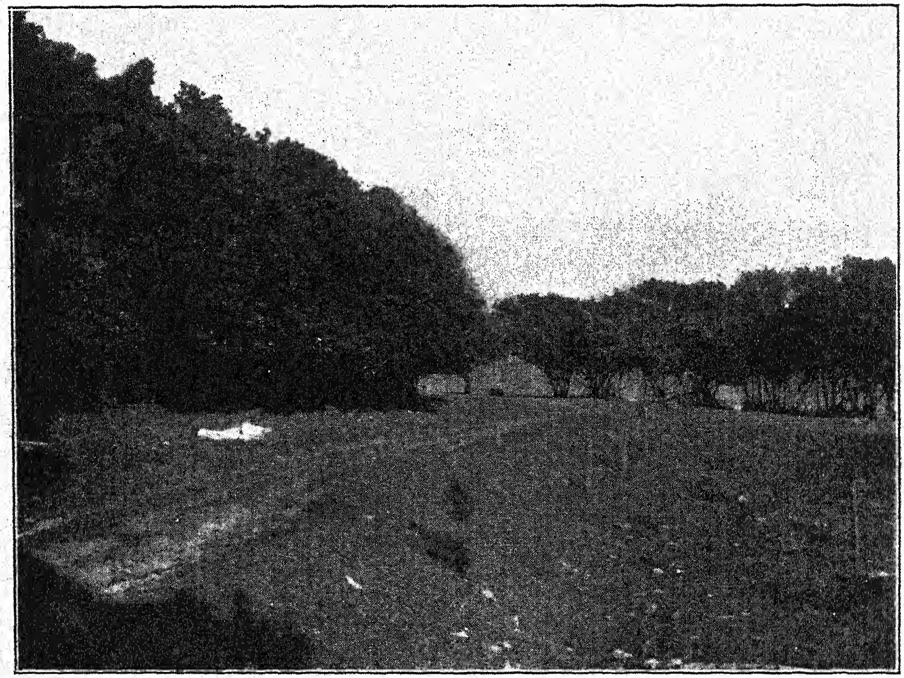

FIG. 18.—SEA GRAPE (*Coccoloba*) ABOVE GRAPE BAY, SOUTH SHORE.

bears panicles of small daisy-like flowers and in summer a showy Golden Rod, a native, is abundant. A purple Morning Glory (*Ipomoea cathartica*), a decorative native climber, flowers continuously from spring to autumn, and forms a pleasing contrast with the universal Oleander, which, introduced in 1790, is used generally for hedges and wind-breaks and makes a glorious show in early summer. The Wild Sisal (*Furcraea*), native of the Bahamas, is abundant in thickets and woodlands; its sharp-spined leaves are seven feet long and its tall flowering pole reaches 30 feet in height. Species of Agave are also found as escapes from cultivation.

There are many beautiful gardens in the Bermudas and in March and April they were at their best. Many of our English garden flowers do well—there were wonderful displays of Stocks, Antirrhinums, Gerberas and other familiar plants. Roses are not successful; the limestone soil, the lack of any resting period and the salt air which the frequent high winds distribute over the islands, may explain this. Hibiscus forms brilliant scarlet hedges, and Bougainvillea, Poinsettia and many others which are greenhouse plants with us flourish in the open. The Royal Palm (*Oreodoxa regia*) and Norfolk Island Pine form stately trees. Pride of India (*Melia Azedarach*) and the Scarlet *Cordia* are planted by the roadside, and fine specimens of Calabash, Banyan and other species of *Ficus*, *Poinciana*, species of *Erythrina*, Tamarind and other exotics are seen in the parks and gardens. Several species of the Australian *Casuarina* grow like natives; and the Allspice (*Pimento*) is threatening the Junipers on the hillsides in Warwick. Our home fruits, Apples, Pears, Cherries and Plums, do not succeed; Peach cultivation was ruined by the fruit fly, but the Loquat does well. Bananas (*Musa Cavendishii*) are generally cultivated, also the Papaw. Oranges, Lemons and Limes were extensively grown in the seventeenth and eighteenth centuries, but the advent of the scale-insect in 1858 rapidly killed out the plants. Citrus cultivation has, however, been recently re-established and with the help of effective spraying should prosper. Tobacco was from the earliest times a staple crop and a Royal proclamation in 1625 forbade the importation into the Realm of England, Ireland or Wales of tobacco not grown in Virginia or Bermuda. At one time it was a medium of exchange in the islands and payment for services was made in pounds of tobacco. Twice a year the tobacco was sent to England. Its cultivation has now completely died out, the production of early vegetables for the American markets being a more profitable industry.

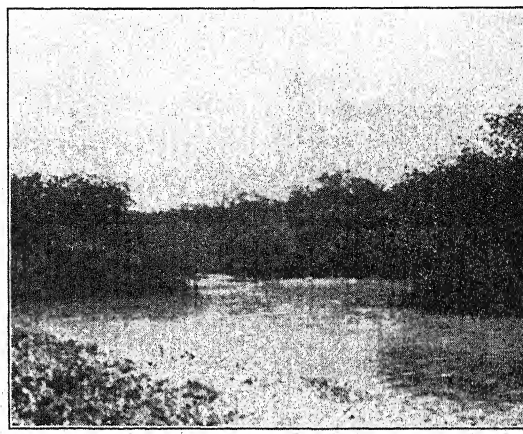

Fig. 19.—Mangrove Swamp, Hungry Bay, South Shore.

Potatoes, celery, carrots, cabbages, onions and tomatoes are largely grown, and efficient Government grading and packing sheds have been established under the Department of Agriculture, which has also some experimental grounds in the Agricultural Park near Hamilton. Owing to a disinclination of the Bermudians for the labour of gardening, the raising of these crops is largely in the hands of Portuguese from the Azores.

FIG. 20.—MANGROVE (*Rhizophora*), HUNGRY BAY, SOUTH SHORE.
The slender roots descending from the branches are visible.

The marine flora and fauna are remarkably varied and beautiful. The floating Gulf-weed (*Sargassum*) is washed ashore in quantity, especially on the sandy beaches of the south shore after rough weather. Attached species of the genus are also found. The numerous rock-pools and caves around the coast, especially in the neighbourhood of Castle Harbour, house a rich flora and the "sea-gardens" of the reefs, which may be viewed from glass-bottomed boats, are one of the attractions of the islands. The well-arranged Government Aquarium on Har-

rington Sound illustrates the diversity and beauty of the fish, coral and other marine fauna. The recently opened Biological Institute under Dr. Wheeler, overlooking Castle Harbour, forms a convenient and delightful centre of work for students of marine life.

By Castle Harbour also are the finest underground caves, a great source of attraction for visitors. Pillars, bosses and stalactites of a brilliant white or variously tinted are mirrored in the quiet water of a deep lake which rises and falls with the tide.

In conclusion, for those for whom Nature's bounty does not suffice, excellent golf-courses are provided, and there are facilities for tennis (a winter game in Bermuda), boating, yachting and other diversions.

BEHIND THE SCENES IN THE MUSEUM. VIII.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

The last of the five Departments with which we have to deal is the Department of Botany, which, though last in the order of the official list, is the oldest of the Natural History Departments of the British Museum. Its origin was in the herbarium of Sir Joseph Banks, who left his collection to Robert Brown with the proviso that it should ultimately go to the British Museum. Actually, Banks died in 1820 and less than seven years later Brown transferred the collection to the Museum, where it formed the Banksian Department with Brown as its Keeper. In 1835 the Sloane and other botanical collections were transferred from the care of the Principal Librarian of the Museum to Brown's Department, which then became known as the Botanical Branch of the Natural History Department, thus, in fact, forming the earliest of the departments of Natural History.

The Sir Hans Sloane collection of plants in the Department of Botany is of the greatest historical and scientific interest, for many famous pre-Linnean herbaria are contained in the 334 volumes of plants. There is also a very large collection of seeds, woods, and drugs, which forms part of the general fruit collection.

Territorially the botanists are more restricted than their

colleagues in any other Department. The whole of the botanical collection has to be examined, arranged, conserved, and exhibited in the uppermost floor of the east wing and in some rooms in the eastern and central towers. As a result the exhibition space is less than half of a gallery and very little of the botanists' work is not "behind the scenes."

The Scientific Staff consists of the Keeper, Mr. J. Ramsbottom, O.B.E., M.A., one Deputy Keeper, and five Assistant Keepers, with the valuable assistance of eight unofficial workers. The clerical and technical staff numbers fifteen, whose duties comprise such varied things as clerical work, librarianship, typing, and the preservation and mounting of specimens.

It may be said that the whole of this staff is engaged upon work essentially for the reserve and scientific collections. The small exhibition gallery is well-arranged, but its limitation in space means that it requires but little alteration or attention. It is true, of course, that temporary exhibitions are frequently made of collections of importance or recent additions, but these make no special demand upon the personnel, and in describing the work of the Department it is essentially the ordinary tasks, the daily round, that call for comment.

The Department may be roughly divided into four parts: first, the General Herbarium, where most of the staff work, and which deals with flowering plants of non-European origin; secondly, the European Herbarium; thirdly, the Cryptogamic Herbarium, *i.e.* the non-flowering plants, fungi, seaweeds, mosses, and ferns; and, fourthly, the Library.

In each of the three purely botanical sections the work is essentially taxonomic or systematic; that is to say, the staff spend their time identifying collections and working out the family relationships of the different groups.

Although plants differ greatly in appearance and habit, their method of arrival at the Museum and their treatment therein are much the same, and these processes, though often taking much time, are comparatively simple to describe. Complete specimens of smaller plants, whether flowering plants, ferns, mosses, or seaweeds, and parts of larger plants (*e.g.* shoots with flowers, fruits, or leaves) are usually pressed in the field by the collector and arrive home in this condition, usually loose and on an ordinary or low-grade paper. The size of the mounting sheets, $17\frac{1}{4}$ by $11\frac{1}{4}$ inches, for herbarium specimens generally and 21 by 13 inches for ferns and palms, regulates the size of the specimens.

On arrival the plants are carefully unpacked, and measures

have to be taken as soon as possible to preserve them. The principal danger to such specimens is from beetles and mites, and accordingly the plants are placed in one of several tanks containing an unstoppered bottle of carbon disulphide. These tanks are in the open air, but are securely closed, and the vapour within circulates among the specimens, killing any animal infestation. Normally a period of fourteen days is sufficient to ensure complete destruction of the pests.

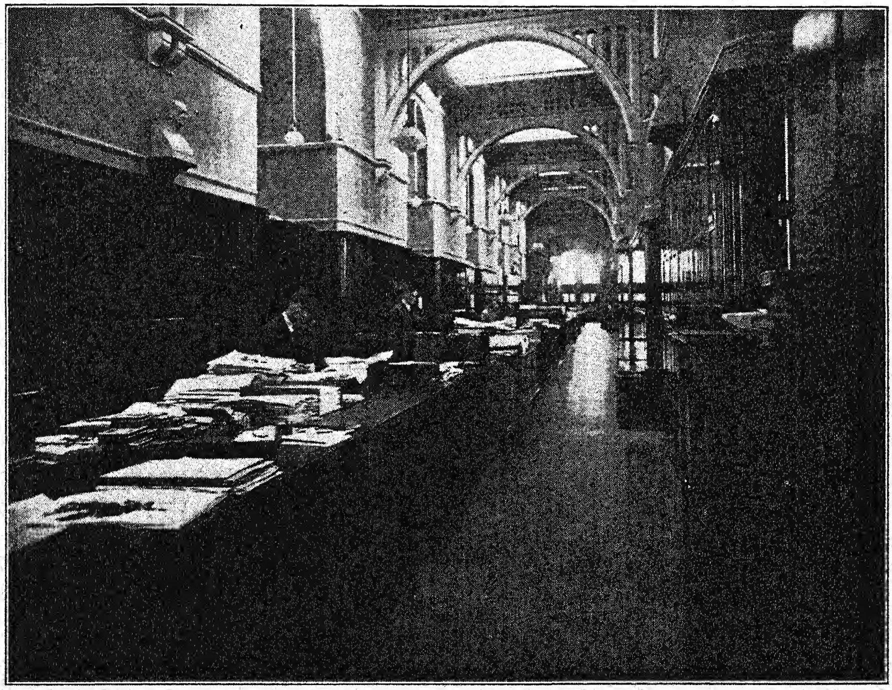

FIG. 1.—GENERAL HERBARIUM.

Thereafter the specimens are removed from the tank and distributed to the appropriate section for examination and identification. Specimens of flowering plants go to the General Herbarium, if they were obtained outside Europe or Great Britain, and to a smaller Herbarium on the same floor, if they are British or European. Both these rooms have a large number of cabinets containing the collections (Fig. 1), and the botanist after tracing the specimen in hand down to its systematic position by means of his knowledge and from the literature can compare it directly with the members of the same genus or species already in the Museum Collection. For this purpose the

stored material has to be very well arranged, accessible and protected. The material is all arranged systematically in the General Herbarium, and the cabinets are of convenient size and arranged as well as can be for the convenience of the staff. Each little cabinet contains a number of shelves; underneath the lowermost is a compartment with naphtha balls, and at the back and sides of the shelves there is space for the vapour to circulate and thus assist the preservation of the plants.

In the European Herbarium identification is aided by having two sets of cabinet collections. The larger and more important is the whole systematic series of genera and species, while the second is a standard collection containing a typical example of each plant. By such means one gets an idea of the appearance and habit of the ordinary plant and then one can compare it with the several variations upon the same sort of theme. For each group of plants there is a separate British collection, these being exceptionally fine and including the herbaria of a large number of famous botanists. The collection of J. Boswell Syme is kept apart to illustrate his "English Botany." There is also a large collection of plate illustrations, which helps greatly in the identification of living plants.

It will be obvious, therefore, that, with the enormous amount of material which is always coming into the Museum and the large size of the collection already in cabinets, there is a pressing need for more room if a truly systematic arrangement and good scientific results are to be maintained.

The members of the Scientific Staff identify the collections allotted to them and describe any that are new to Science. When the identification is complete, and if the material is to remain in the Museum, it has to be mounted.

The mounting room in the extreme eastern tower (Fig. 2) is where the specimens are transferred from their temporary dressing given by the collector to the neater and more permanent arrangement of the Museum. The plant, branch, fern-frond, or piece of moss, whichever it may be, is fixed down to a herbarium sheet by means of gum; more fragile plants are first mounted on ordinary white paper. Small strips of gummed linen paper fix the more outstanding and delicate parts. When thus mounted, the sheets are placed in an ordinary hand press for twenty-four hours, after which they are ready to assume their proper place in the herbarium.

There are, of course, modifications of this routine; certain lichens and mosses are mounted on a piece of gummed paper first and the whole is then fixed to the large sheet, while strips

of linen stretch across the whole specimen. Nor can the material always be pressed afterwards, for myxomycetes, some mosses, and pieces of fungi are so delicate and fragmentary that any undue handling would prove ruinous. Such specimens are fixed in little cardboard boxes which are duly mounted. With these exceptions the treatment of the flowering and non-flowering plants is much the same. The sheet holding the mounted specimen bears on the back the name of the area in which the specimen was found and the Departmental identifica-

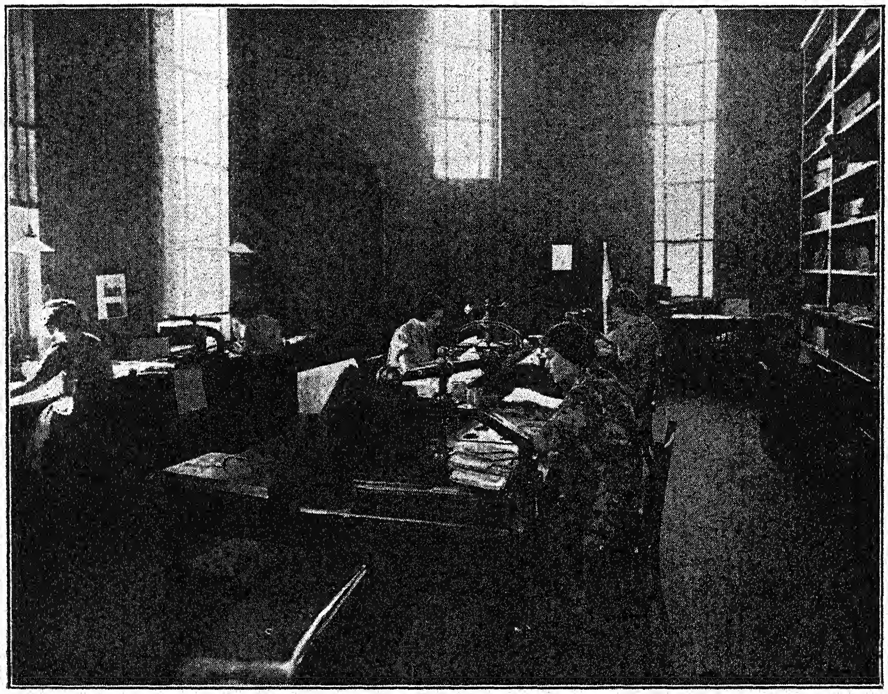

FIG. 2.—PLANT-MOUNTING ROOM.

tion mark, while on the same side as the plant is affixed a label bearing the history and scientific details of the particular specimen.

Certain of the non-flowering plants demand a more elaborate technique in identification as well as in mounting. Thus, many require microscopic examination, particularly such tiny yet varied things as the diatoms, of which the Department has the largest and finest collection in the world. These have to be mounted upon glass slides like other microscopical preparations and are therefore easily stored.

The fungi, which are very important from many points of view, again demand a different method of treatment. Fleshy fungi such as mushrooms do not make satisfactory herbarium specimens, and the best method of recording their appearance is simply to draw them and paint the drawing as accurately as possible. This is frequently done, with the result that in the Department there are numerous volumes of excellent hand-painted illustrations, an almost perfect identification series. The

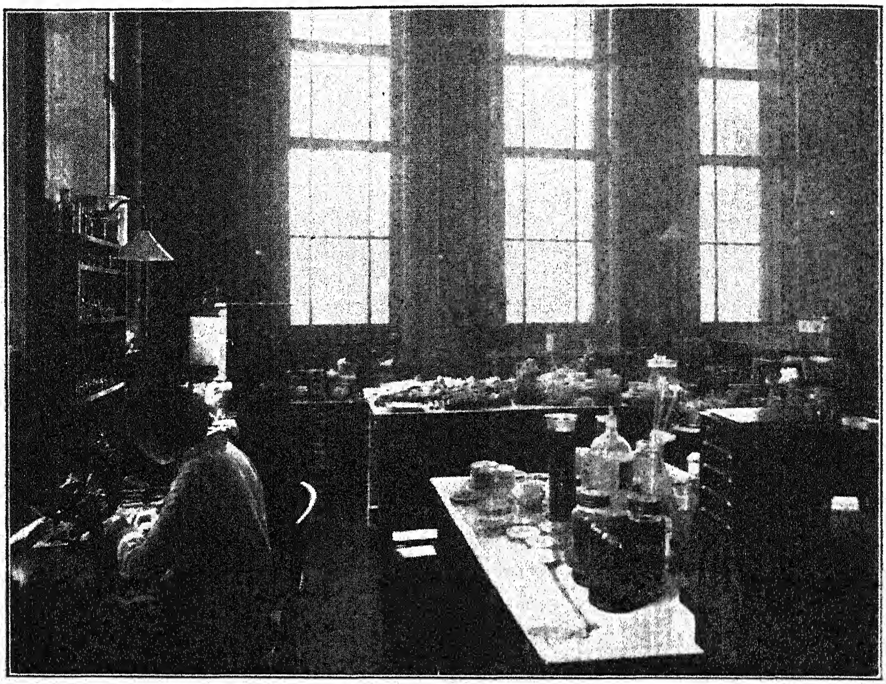

FIG. 3.—CRYPTOGAMIC LABORATORY.

larger bracket fungi are not generally preserved whole, as a slice is usually sufficient for identification.

Not all the fungi can be so obviously determined and many of the moulds have to be grown as cultures so that identification may be made. For this purpose there is maintained a well-equipped laboratory (Fig. 3) with sterilizers, steam and electric ovens, an ultra-violet lamp, cameras for photomicrography, and facilities for storing the sealed test tubes and encouraging the growth of the contents.

Many people will know that some materials are constantly being attacked by moulds. Most plants, many paints, foods,

and, unfortunately, the human body are all liable to attack from these microscopic forms. There are many diseases, especially the various ringworms, which are due to vegetable parasites. It is almost impossible to identify these correctly at first sight, and therefore many people, tradesmen, contractors, and hospitals, send in the infected material, and in the laboratory the fungus is cultivated and finally identified so that proper curative measures can be employed.

Although, as has been pointed out, the work of the Department is essentially systematic and a constant setting in order of the broad basis on which all botany must stand, the economic value of the work should not be lost to view. Nowadays, when governments have recognized the immense importance of the fungi by appointing official mycologists in many places, the work done in the Botanical Department has a special value which is probably too little realized by the public.

Thus, day after day, the work of the Department goes on. It may not be spectacular nor done before the admiration of an excited crowd, which appears to be something of a criterion nowadays, but it is important in a hundred ways, for agriculture, brewing, building, painting, medicine, and public health, for chemistry, both industrial and pharmaceutical, and for the making of paper for the books that botanists (and others) must write.

In 1922, in an official publication, the number of plants in the Collection was estimated at four and a half millions, but that number must be now greatly increased, as more than 110,000 specimens were received last year alone. This number gives some idea of the amount of purely routine work that has to be done, yet, in addition, there was considerable correspondence, and 4210 visitors for consultation or research.

Within recent years several members of the staff have made important collecting trips to such places as Australia, the Balkans, Africa, the Tortugas, and many parts of Europe.

The Department is well represented on many strictly scientific societies and on the councils of those associations concerned with the preservation of plants and the beauty of the countryside; yet despite the amount of work that has to be done in many ways, its members consistently undertake research and produce many papers. This research is greatly facilitated by the excellent library of purely botanical works (Fig. 4), those dealing with special groups being segregated into sectional libraries. Altogether it contains upwards of 30,000 volumes. The library contains also a large collection of original drawings and manuscripts. The Department has a strong historical background,

as it contains so many famous collections, such as the highly important Sloane Herbarium, the Banksian, the Brown and the

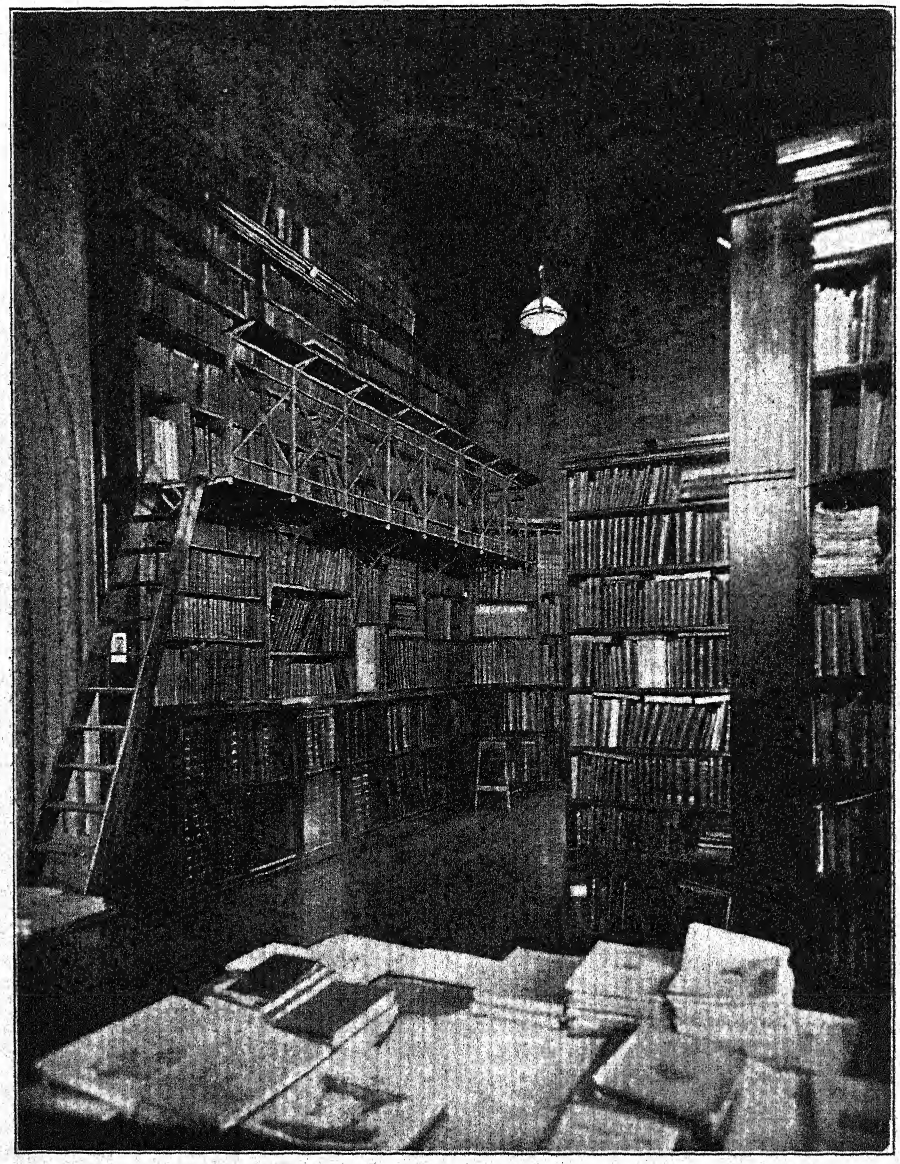

FIG. 4.—BOTANICAL LIBRARY.

Boswell Syme Herbaria, the Hortus Cliffortianus, and this fact coupled with the possession of such an excellent library makes the Botanical Department the first of its kind in the world.

In the course of these articles attention has frequently been drawn to the very important Departmental libraries, and while these are housed in the particular Department and taken care of by a member of its staff, and are under the control of the Keeper, the books themselves have to be catalogued by the staff of the General Library. It may be well to define the functions of the different libraries. The Departmental libraries contain only works relating to the particular subject of the Department, but many serials, such as the proceedings of general scientific societies, scientific magazines and general books, treatises or works of reference, cover several different branches of natural science. These are all housed in the General Library which forms a central minor Department. It is staffed by a Librarian, who ranks as an Assistant Keeper, by a bibliographer, a clerk, one technical assistant, a cataloguer, and an orderly. This comparatively small staff is responsible for the cataloguing of all the books in the Museum and is more or less indirectly in charge of them. The number of books in this library is approximately 75,000, and such is the increase of publication in these days that this total number is rapidly being increased. In 1933 alone 5000 books and periodicals were received, of which 40 were periodicals new to the library.

In value, in range, in historical worth and scientific utility there is no comparable collection in the world, and it is looked after with the care it deserves. But the publication of catalogues, the preparation of card-indexes, examining, cleaning, and preparing books for the binders make no small task, and, when coupled with the innumerable inquiries from within and without the Museum and the visits of students, they make it a very difficult matter to keep pace with the tide of additions. Nor does this affect the staff alone. When the library was planned, it was allotted a long narrow gallery to the immediate east of the Central Hall, and at that time it was sufficient space. The library still has that long and narrow corridor for its main storage space (Fig. 5), together with a small basement with a mezzanine floor and two recently bricked-in portions of the basement of the Central Hall, and already this space is all allocated and very largely filled. Additional space is urgently required if the library is to fulfil its truly important function and to supply adequately the needs of both staff and public.

This increase of space is not only a library affair. The Departments are cramped and the provision of a central lecture hall is of some urgency. Yet there are many otherwise thoughtful people who regard the expenditure of public funds

upon a museum as an unjustifiable waste. There are others with simple arithmetical minds who, dividing the annual grant to the Museum by the number of visitors, declaim that the cost per person is too high. If the worth of a museum is determined only by the number of people who enter its doors, perhaps the allegation is correct and museums should retire to make way for cinemas and waxworks. In a prominent London daily paper a little time ago, a young man made unfavourable comment on the attractions of the British Museum as compared with the

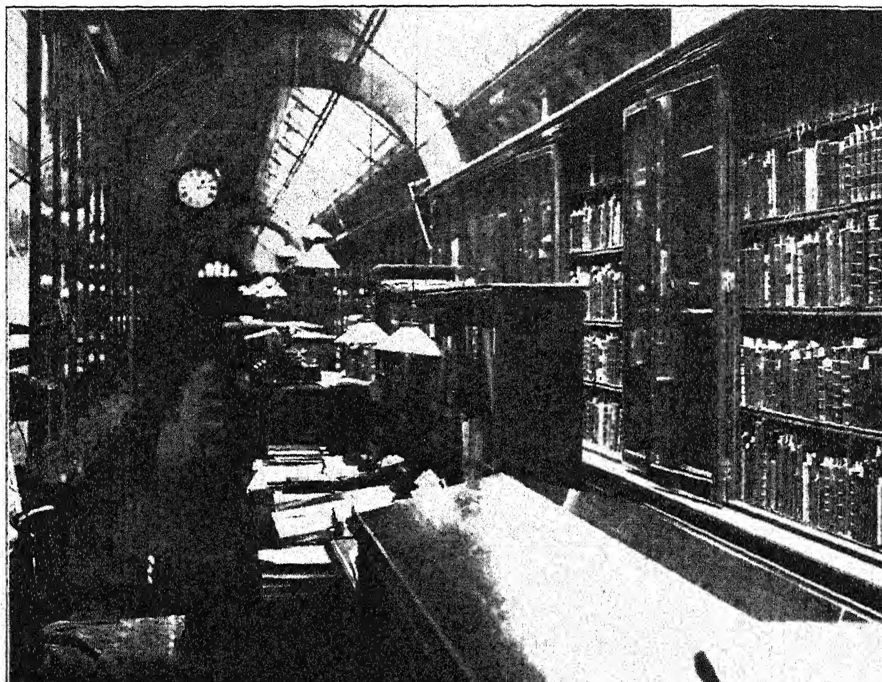

Fig. 5.—General Library.

Exhibition of Flemish Art at Burlington House, basing his remarks on the attendances. He forgot to mention that the Flemish exhibition was of only limited duration and will probably never be repeated, certainly not in this generation; while the British Museum is open every day but two in the year and has been open for over a hundred and eighty years.

It is this ever-present and free service that leads to lack of appreciation, this familiarity that produces a museum-contempt. After all, say the critics, what is natural history? a mere chasing of butterflies and moths, a little egg-collecting, a day

or two in the country; and so it may be to them. In the Natural History Departments of the British Museum the pleasures of the field naturalist and the studies of the biologist are combined in a departmental unity to produce a harmony that perhaps only trained ears can appreciate, but which none the less is there. What is natural history? It is a knowledge of natural processes, of the life we lead and the world we live in, a knowledge that is fundamental, that controls the food we eat, the drink we need, the clothes we wear, and the tools with which we work. Industry, commerce, the materials of amusement, the very methods of our social and domestic life, directly or indirectly, rest upon one of the branches of natural history. The ways of commerce are easily seen, the wheels of industry are quickly heard, but the calm and basic research work that must precede them both, that really governs them both, is efficient, but unseen and silent. The purpose of these few articles has been to show how some of the work at least is accomplished behind the scenes of a public institution, where the work is for the public, and where the age-old store of natural knowledge is to be had quite free and only for the asking.

THE CRUSTACEAN PARASITES OF FISHES.

By Robert Gurney.

It is a curious fact that in this country, where so many people are devoted to angling for freshwater fish, almost nothing is known about fish parasites. On the Continent the Crustacean parasites of fish are numerous, and often cause serious destruction of their hosts, but here they are either extremely rare or no attention has been paid to them. The fish louse (*Argulus*), which creeps about over the scales, is fairly well known and on rare occasions has been supposed to have caused some losses of fish, while the gill maggot of the salmon is also well known to anglers and to commercial catchers of the fish; but the commonest and the most injurious gill parasite on the Continent, *Ergasilus sieboldi*, has never been recorded in this country. Is it really absent, or has it simply been overlooked? Two years ago a request to anglers to search for these animals was published in the *Fishing Gazette*, and the letter, with illustrations, was reprinted and circulated to all fishing clubs in the United

Kingdom, but the result was most disappointing, though not without results.

The inquiry brought me specimens of a species, hitherto not recorded as British, from some imported goldfish in Edinburgh, which suggested that, even if this country is naturally free from fish parasites, they might at any time be introduced with imported fish. For instance, the importation of black bass has been suggested, a fish which in America is very often infested by a species of *Ergasilus*, and it is quite possible that the parasite might be introduced to the detriment of our native fishes. The second point of interest was the discovery that two species of gill parasite are to be found on grayling and trout in one river in Yorkshire, one of which had not previously been recorded in this country. The other had been described from trout in Scotland under the name of *Achtheres percarum*; but the true *A. percarum* has not yet been seen in Britain, and this particular species has to be given a new name. It seems most probable that these parasites are not so rare in this country as has been supposed, and that anglers could contribute more to our knowledge than they have done.

The matter is not without interest, for it seems to touch upon the problem of distribution. For example, if *Ergasilus* is really absent from this country, it is a fact which requires explanation. It is found on a great variety of fishes abroad, and it does not seem possible to suppose that this country could have been re-populated by fishes after the Glacial period without the introduction of the parasite with them. The only explanation possible seems to be that *Ergasilus* is a genus which has only in recent period extended its range to western Europe. The main home of the genus is in North America, where a number of species are found, and only one species occurs in Europe. So far as concerns the species of *Salmincola* (which includes the gill maggot of salmon) other problems arise. It is doubtful if the genera *Salmincola* and *Achtheres* can really be separated, but at least they do have the distinction that the former is confined, so far as we know at present, to salmonoid fishes. The new parasite, to which I have given the name *Salmincola gordoni*, is so like the parasite of the salmon that one is inclined to suggest that it may be a British derivative of that species which has become purely a freshwater species.

Of the salmon maggot we do not know as much as we might. It seems to be established that it breeds only in fresh water, but the fish returning to the sea carry the parasite with them, and return to the rivers bearing the maggots mature and with

eggs ready to hatch. As it may therefore live for long periods in the sea, it looks as if this parasite at least is a species of marine origin. One may suggest that *Achtheres* and *Salmincola* are comparatively recent colonists of fresh water in the northern hemisphere. It is impossible to offer any explanation of the fact that *S. thymalli*, a comparatively rare parasite of the grayling, does occur in this country, whereas the much commoner *A. percarum* does not.

Another species, about which information is wanted, is *Lernaea cyprinacea*. It has been included in the British fauna on most doubtful evidence, but it is found all over northern Europe, and as far east as Japan, and there is no apparent reason why it should not occur here. If one felt confident in the observation of anglers one would dismiss it altogether, but this one hesitates to do at present.

For an increase in knowledge of these parasites we must depend upon anglers, and I venture to ask again for help. Firstly, for more records of the parasites themselves. While *Lernaea* is to be looked for on the sides of the fish, with its head embedded under a scale and the body projecting as a thread perhaps half an inch long, *Achtheres*, *Salmincola*, and *Ergasilus* are found on the gills only. Their bodies are generally yellowish, and so contrast with the red of the gill, but the egg bags are perhaps more readily seen, as they generally project well out from the gill surface. If any such parasites are found it would be well to preserve the whole head of the fish, or the whole gill, in spirit or formaline, and send it to the Natural History Museum. If packed in wet moss or paper, and dispatched immediately, even a preservative would not be necessary.

One thing which is very much wanted is material for the study of the life history of the salmon maggot. No one has ever seen the male, or the early stages of its development, and these are likely to be found only on fish which have been some time in fresh water. This raises a difficulty, since kelts, on whose gills these stages are most likely to be found, may not be killed by anglers. On the other hand, such fish are sometimes found freshly dead, and the head of such a fish would be most useful. If this appeal should come to the notice of a river bailiff, it may be possible for him to supply the need.

EFFECTS OF DROUGHT IN THE LORIAN SWAMP, KENYA COLONY.

By Capt. A. T. Curle.

The Lorian Swamp, which is situated in the Northern Frontier Province of Kenya Colony, covers an area of several square miles, which is dense with elephant grass and extremely boggy. Near the centre the River Uaso Nyiro finally peters out in a series of disconnected pools flooding over the swamp.

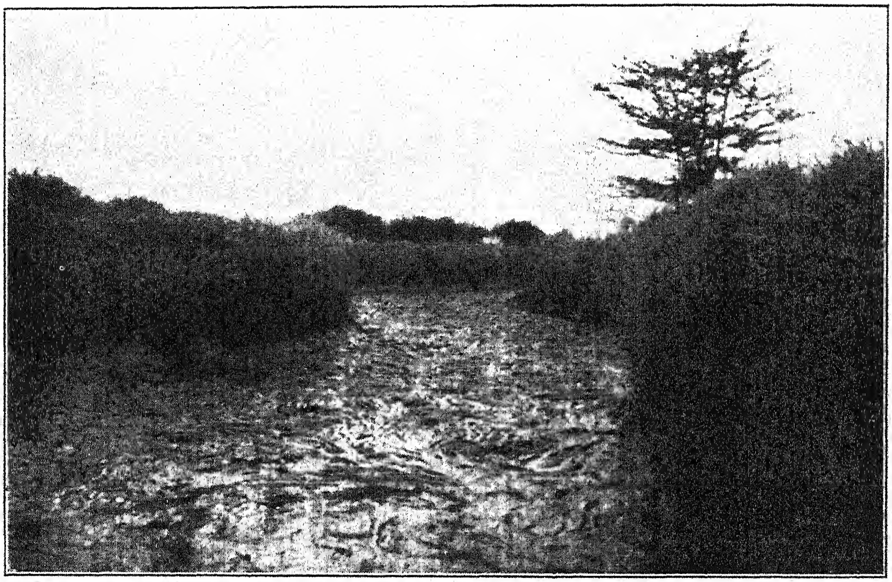

Fig. 1.—Lorian Swamp: Mud Fish in Mud Pool.

Entry is only possible by following some of the many elephant tracks. Small game is not plentiful, but many different types are represented by a few of their species: water-buck, buffalo, Grant's gazelle, oryx, gerenuk, and zebra; elephant in number may be seen of all sizes or else their presence is indicated by fresh tracks. The hippopotamuses living in the river pools in the centre are quite unapproachable and give no indication of their presence. Such were the conditions which I found in February, 1928, when I spent ten days there.

In June 1928 I returned to the Lorian Swamp and spent a fortnight there. The rains round Mount Kenya had failed that spring, and the River Uaso Nyiro dried up in its lower

reaches, with the result that the Lorian Swamp, which it feeds, also suffered and the series of pools where it terminates became quagmires below the level of the swamp. As the water receded and the marshy area dried up, cattle and goats penetrated towards the centre in search of grazing, trampling down the elephant grass and causing the buffalo to leave the swamp accompanied by many of the elephants, and the hippopotamuses were gradually driven into the last remaining mud pool, which failed to cover them; millions of mud fish shared this with them, as can be clearly seen in the picture (Fig. 1).

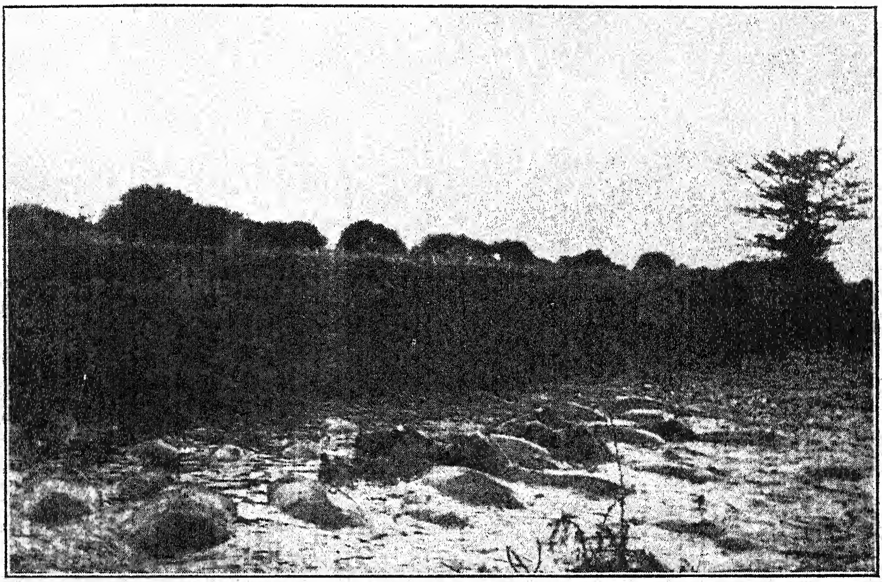

FIG. 2.—LORIAN SWAMP: HIPPOPOTAMUSES IN MUD POOL.

The hippopotamuses left the pool at night in search of grazing, returning before dawn with the exception of one, which had a sore on his flank and evidently maddened by the fish biting the exposed flesh was compelled to spend the day in some bushes, where I was lucky enough to find him on three separate days and induce him to rejoin the others so that I could photograph him on the way.

The other types of animals were not much better off when deprived of water. Elephants roamed the swamp day and night in search of water, sacrificing their usual mid-day siesta. Close to our camp a full-grown elephant maddened by thirst seized a goat and prodded it to death with its tusk and trampled

the corpse flat with its feet, emitting fearful bellows. A young elephant fell down a well, dug in the river bed, which produced a little water. It was impossible to salvage, as it had gone in head first and overbalanced in the mad search for water. Several full-grown elephants died in the swamp, presumably from thirst, while we were there.

The hippopotamuses with millions of mud fish packed in the pool provided an amazing sight (Fig. 2) and produced the strongest and foulest smell that it is possible to imagine. I have no doubt that the condition reproduces the manner in which certain fossil beds must have been laid down. Should the fish and hippopotamuses have perished in the mud, their bodies would not have been attacked by hyaenas, jackals, or birds, and on the first flood of the river coming down with a bore over a foot high, mud would be deposited in the pools, and in all probability the line would alter thus completely sealing the remains.

RECENT BRITISH EARTHQUAKES.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

From the seismologist's point of view the last eighteen months have been unusually interesting, for within the first three months there have been important, even serious, earthquakes in many parts of the world, south-eastern Europe, South Africa, China, Japan, South America, California, and India being particularly affected. In this country fortunately there has been no pronounced disturbance for some months, with the exception of one or two shocks, which call for notice in these pages.

At about 8.30 on the morning of Saturday, January 14, 1933, an earthquake was felt in Manchester and the north of England, which was sufficiently severe to break windows, overthrow walls, and cause a certain amount of apprehension among many residents. At first it was thought that the shock originated in the well-known Pendleton fault, and that its effect was confined to an area of about seven miles radius from Manchester. Later reports, however, widened the affected area considerably, and some show that it was felt no less strongly than the North Sea earthquake of June 7, 1931. It was of appreciable intensity in the west at the Point of Ayre lighthouse in the Isle of Man, on

the east at Whitby and Bridlington, and a correspondent at Felton in Northumberland has reported that the furniture in his bedroom creaked and shook, while out of doors the pheasants were alarmed. At Kendal, in the Lake District, there were loud rumblings and houses were generally shaken. Similar occurrences were observed at Altrincham and Prestwich, near Manchester, and people at Heysham and Morecambe were so alarmed that they left their breakfast-tables and went out of their houses. In the mining districts there was a general fear that an explosion had occurred, and many women rushed to the pit-heads for news.

The most severe effect was felt in the Wensleydale district. Furniture was moved about in a house in Gammersgill, and a child was thrown out of his bed at Carlton, in Coverdale. In Upper Wensleydale itself the people rushed from their houses, walls were split, plaster fell from ceilings, and masonry was dislodged from chimneys; several women suffered from shock. At Askrigg and Bainbridge there were severe tremors, and the inmates of Bainbridge workhouse rushed in a panic to the master's quarters. The area affected would thus appear to have been about 25,000 square miles, and the maximum intensity 8 on the Rossi-Forel Scale, so that the shock was unusually severe for England.

Through the kindness of Father J. P. Rowland, S.J., Director of Stonyhurst Observatory (Fig. 1), I have received accurate information concerning the recorded shock. Although pronounced locally, it was too feeble to be recorded at Kew, and was only faintly recorded in the northern observatories. The seismogram at Stonyhurst gave the best record and is here reproduced (Fig. 2). The feebleness of the records as a whole make the interpretation of phases difficult, but the shock appears to have commenced at 8 hr. 30 min. 20 sec. G.M.T. It lasted for nearly a minute and was pronounced for about ten seconds. The epicentre as calculated from the instrumental records was situated in Upper Wensleydale, a short distance north-east of Hawes Junction, a position which agrees very well with the observations quoted in the Press. This district is extensively faulted and there is every reason to believe that a minor readjustment along part of the Craven fault, or one of those a little to the north of it, was responsible for the shock. The Craven fault has been responsible for several slight earthquakes in the past, none of which has caused serious damage.

Since that date little of seismological importance has happened in this country, although 1934 has produced a few shocks

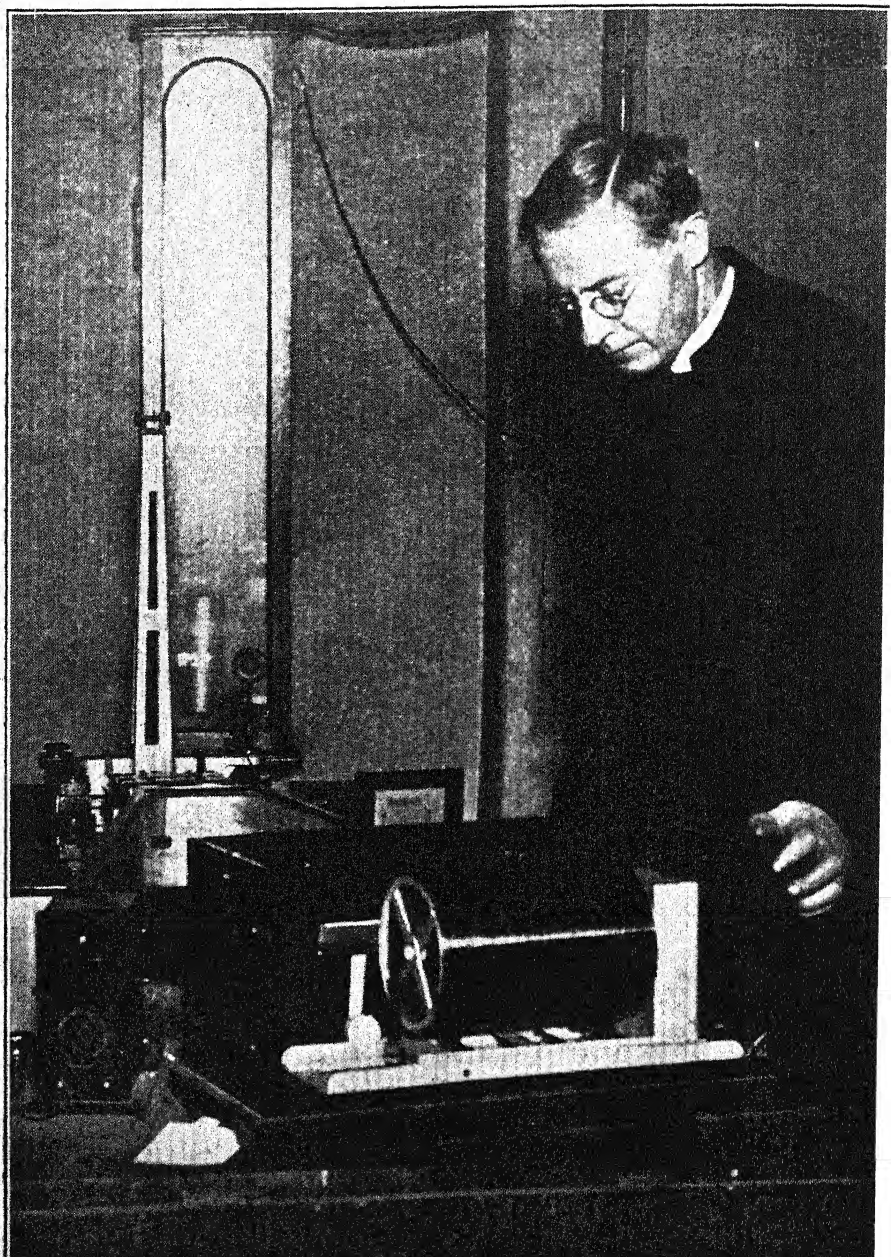

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FIG. 1.—FATHER J. P. ROWLAND, S.J., DIRECTOR, AND SEISMOGRAPH, STONYHURST OBSERVATORY.

recently, and one unusual event. The latter took place on Sunday, April 22, when there was commemorated in several services at Colchester the great earthquake that had taken place precisely fifty years before. There seems to be no record of any similar service of remembrance in Britain for the simple reason that this earthquake was the most destructive this country has experienced in historical times. Although the shock was more restricted generally than in the case of the widely felt North Sea earthquake of 1931, no fewer than 400 buildings, including 10 churches and chapels, were damaged in Colchester. At Wivenhoe three-quarters of the chimney-stacks in the town were destroyed. So widespread was the damage in the Colchester

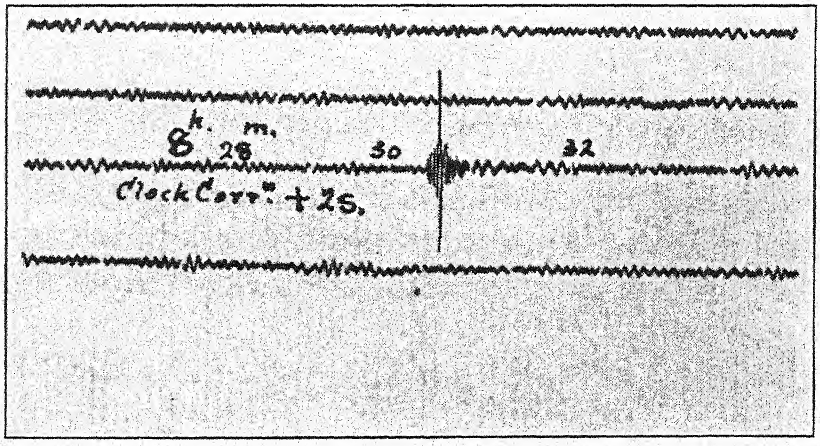

FIG. 2.—SEISMOGRAM OF EARTHQUAKE, JANUARY 14, 1933.

district that a Mansion House Fund was raised to assist the sufferers to repair the damage.

In 1934, and a day later than the Colchester commemoration, the newspapers recorded a tremor at the mining village of Elvington, seven miles from Dover. The shock occurred at four o'clock in the morning and residents were awakened by the shaking of their beds and the rattling of ornaments to the accompaniment of a low rumbling noise. Although there have been few earthquakes in Kent, one or two have previously been recorded from the Dover–Canterbury district. In the absence of confirmatory evidence and records, and in view of the very local incidence of this shock and the fact that it took place in a mining village, it is much more probable that it was an earth-shake and not an earthquake. Its origin was no doubt in the settlement of one of the underground workings.

The more recent earth tremors are all Scottish in origin, and from the northern half of Scotland at that.

Early in the morning of Thursday, June 7, and apparently for nearly two minutes, "houses and furniture vibrated, crockery rattled, and beds were shaken" in Dufftown in Banffshire. The shock was sufficiently strong and alarming to awaken people from sleep, but apparently it did not attain to an intensity of more than 4 on the Rossi-Forel Scale. Only one tremor was felt and no damage was done. There is little doubt that the origin was in the fault line, a mile or two away, which runs for a short distance parallel to the River Spey.

Much more widespread in its effect was the earthquake of Thursday, August 16, which was distinctly felt in the counties of Ross and Cromarty, Inverness, Nairn, and Sutherland. Definite reports have been received from Dingwall, Strathpeffer, and Inverness, but the times vary somewhat. In Inverness the precise time was apparently 3.28 a.m., Summer Time. Except for one or two ornaments broken no damage was done, although many people were awakened and some apprehension was aroused. This district, so closely associated with the Great Glen Fault, has frequently been disturbed by earthquake shocks, most of which, like the present one, had their origin in a part of that fault line somewhere between Inverness and Loch Ness.

Apart from these few definitely reported occurrences there are only the customary reports from Comrie, which still maintains its reputation for "earth-shakiness."

BOOK NOTICES.

The Behaviour of Animals: an Introduction to its Study. By E. S. Russell. Pp. viii + 184, with 6 plates and 26 text-figures. (London: Edwin Arnold & Co. 1934. 10*s.* 6*d.*)

Dr. Russell holds at University College, London, the only lectureship on Animal Behaviour yet established in this country, and this book is based on the course of lectures which he gave there in 1933. A broad philosophical outlook and an unusual capacity for lucid exposition make the book a pleasure to read.

Students of the behaviour of animals are broadly divided into two schools. On the one hand we have the experimental or laboratory school, and on the other the observational or field-naturalist school, and the cleavage between them goes very deep. The former, studying the animals under controlled conditions, attempt to discover the reactions to isolated stimuli; the latter, interfering as little as possible with natural conditions, study the responses of the animal to its total environment. Both methods have added greatly to our knowledge, but Dr. Russell insists that only the second can increase our understanding of animal behaviour. The experimentalists analyse behaviour into reflexes, simple or conditioned, and give it a mechanistic explanation. The observational school (which does not, of course, exclude a limited amount of experimental variation of conditions) lays emphasis on the conative or directive nature of the animal's activities and reaches an organismal or holistic interpretation. Pavlov, for instance, tells us that instincts are "chain reflexes." For Russell, this statement would need a good deal of qualification and, we fancy, he would lay emphasis on the "chain." Russell makes it perfectly clear that the observational study of animal behaviour must not be allowed to degenerate into the uncritical collection of "dog stories"; it must be severely objective, "discarding all preconceived notions and observing exactly what happens—not an easy task." His experience, more especially in marine zoology, enables him to draw his examples from a wider range than is usual in writings on the subject. His chapters on "Maintenance Activities," with their insistence on the importance of the "ecological norm," and those on "Instinctive Behaviour" will appeal particularly to the field naturalist, and the concluding chapter on "Perception and the Gestalt Theory" brings the subject into relation with modern psychology.

W. T. Calman.

The Dinosaurs. A short history of a great group of extinct reptiles. By W. E. Swinton. Pp. xii + 233, with 25 plates, and text-figures. (London: Thomas Murby & Co. 1934. 15*s.*)

Few extinct animals have caught the popular fancy as the dinosaurs have done. To the average newspaper reader they stand as the very types of what he is fond of calling "prehistoric monsters." It is surprising therefore to find that they have never had a book devoted to them, and it is fortunate that, when the book came to be written, the task was entrusted to the very competent hands of Dr. Swinton. The student of zoology or palaeontology will find in this volume a trustworthy introduction to the study of the dinosaurs and the references given at the end of each chapter will provide him with guidance if he wishes to pursue the subject further. On the other hand, the "general reader," if he has any interest in biology (and is prepared, perhaps, to do a little judicious "skipping"), will be fascinated by this story of the rise and fall of a once dominant division of the animal kingdom.

In successive chapters Dr. Swinton discusses the physical conditions of the world in which the dinosaurs flourished, their structure, classification, evolution, probable habits, and even their diseases. He discusses how far their modes of life can be inferred from their remains and shows commendable caution in speculating on the possible reasons for their extinction.

Dr. Swinton writes easily and with a running pen. As such pens will, it occasionally splutters a little (one sentence has been read over half a dozen times and the reviewer is not yet quite sure what it means), but there are many happy phrases and telling passages. As an example, the following could hardly have been better put :—

"The mechanical limits of the body were all against sudden leaping movements, swift pursuit, or the battle of wits that characterizes mammalian contests; and, no doubt, the contests of that Cretaceous world, could we see them now, would seem to have the stiffness of amateur activity rather than the smoothness of the professional even though the feud was real and terrible."

The text-illustrations are adequate, though some of them might with advantage have been clearer. The plates, however, are admirable. Most of them are photographed from reconstructed models of the animals prepared under the direction of the author by Mr. Vernon Edwards. They convey a most convincing impression of how the animals may have appeared in life.

W. T. CALMAN.

Huxley. By E. W. MACBRIDE (Great Lives). Pp. 143. (London: Duckworth. 1934. 2*s*.)

PROFESSOR MACBRIDE is about to vacate the chair once occupied by T. H. Huxley at the Imperial College of Science, and he is therefore in some respects specially qualified to write this sketch of the life and work of his great predecessor. His fluent and vigorous style makes the book easy to read. He touches on the human side of Huxley's family life and friendships, and discusses his position and influence in the spheres of science, education, philosophy, and religion. With the last two of these we are not concerned here, although it may be remarked in passing that some of Huxley's philosophical writings, which seemed so conclusive and unanswerable to us forty-five years ago, have stood the test of time very badly. MacBride considers that the reform of zoological teaching and the introduction of the "type system" was probably Huxley's greatest service to science. He does not mention the little book on "The Crayfish" which is still, in some respects, the best introduction ever written to the study of zoology.

It is perhaps remarkable that Darwin's most fervent disciple made no contribution to the theory of evolution. He accepted Darwin's theory of natural selection ready-made, his enthusiastic reception of it being due, as MacBride points out, largely to the mechanistic bias of his mind. There are probably few biologists now-a-days who would follow Huxley in believing in the all-sufficiency of natural selection, but perhaps there are not very many who will go the whole way with MacBride in rejecting it as one of the main factors in evolution. The old objection to Darwinism, that "selection can produce nothing new; it can only 'select' what is already there" (p. 113), would only be valid in the case of parthenogenetic organisms. Darwin's theory assumed sexual reproduction; he believed that the elimination of the unfit would bring together parents that would otherwise never have met except by the rarest chance, and that the offspring of these parents would be something new. The Darwinian theory is better represented by the German phrase "natürliche Züchtung" than by Darwin's own expression "Natural Selection."

Professor MacBride doubtless impresses upon his students the old advice to

verify their references, but he occasionally fails to follow it himself. Owen was never "head of the British Museum" (p. 44), and Flower, in 1862, was not "now at the British Museum" (p. 71). MacBride knows as well as anyone that Huxley did not invent the word "biology" (pp. 52 and 65), which was used by Lamarck and by Treviranus more than twenty years before Huxley was born. It is a pity to repeat the American libel that Darwin "was jealous of Lamarck's fame as the real originator of the doctrine of evolution" (p. 112). It seems incredible that anyone who has read Darwin's "Life" should suppose him capable of being influenced by such a feeling. W. T. CALMAN.

Insects as Material for Study. Two Inaugural Lectures delivered on 17 and 24 November, 1933, by G. D. HALE CARPENTER, D.M., Hope Professor of Zoology (Entomology). Pp. 38, with 1 plate. (Oxford: Clarendon Press. 1934.)

IN these two lectures Professor Hale Carpenter deals not with the systematics of Insects, immense as is the "material for study" which they provide, but is concerned only with the various problems of their bionomics, the evolution of their habits and behaviour and the part that they "have played and are playing in testifying to some of the larger truths of Biology," subjects which build up, so to speak, the living body in relation to which systematics are but the dry bones.

In its accumulation of collections on a bionomic basis under the inspiration of Professor Poulton the Hope Department is probably unique, and in enlarging and working up these collections on the lines indicated by Professor Carpenter's lectures the Department will be but continuing and developing the policy of his illustrious predecessor, to the enhancement of its already world-wide renown.

K. G. BLAIR.

The Restrictive Law of Population. Huxley Memorial Lecture 1934. By JOHAN HJORT. Pp. 46. (London: Macmillan & Co. 1934. 1*s*.)

PROF. HJORT is a biologist and oceanographer, who is distinguished especially for the brilliant and long-continued series of researches by himself and his pupils on the application of scientific methods to the problems of the fishing and whaling industries. In the Huxley Memorial Lecture, which he delivered at the Imperial College of Science and Technology in May last, he starts with Malthus' "Essay on Population," and shows how the principles involved in the rise and fall of populations are essentially the same whether the units concerned are yeast-cells, or herrings, or whales, or human beings. The problem of the fishery expert called upon to define the "optimum catch" and that of the statesman trying to reorganize the society of a post-War Europe are more nearly connected than either of them is accustomed to think. Those who listened to the lecture will be glad to have it in permanent form, for its argument requires and will repay reading more than once. W. T. CALMAN.

Reptiles of the World. By RAYMOND L. DITMARS. Pp. xx + 321, with 89 plates. (London: John Lane. 1934. 18*s*.)

THE first edition of this book, published twenty-three years ago, has become almost a standard work among those who desire a readable account of present-day reptiles. The principal defect of the original book was that too much space and too many illustrations were devoted to the North American species. The new edition makes an attempt to remedy this failing, as well as to incorporate the advances which have been made in our knowledge since it first appeared. The scope and method of treatment, by descriptions of typical species and profuse photographic illustrations, remain the same; but in the new arrange-

ment the illustrations are divorced from the text and appear together at the end of the book. This, though less convenient for the reader, in no way affects the value of the book to all who are interested in this much misunderstood group of animals. Its greatest appeal will naturally be to the not-very-serious amateur, for whom it is written; but even specialists will find the numerous, extraordinarily fine photographs of the greatest value. Despite the author's expressed hope that the book is "everywhere in accord with the latest results of the scientific study of the subject," serious students will deplore his taxonomy and nomenclature, whilst most English readers will often be puzzled by the queer usages of common words; what, for instance, are "parasitic proportions" (pages xi and 3), and how do caimans "appeal to the two species of alligator in internal —characters" (page 5)?

H. W. PARKER.

Toads and Toad Life. By JEAN ROSTAND, translated from the French by JOAN FLETCHER. Pp. xii + 192, with 11 figures. (London: Methuen & Co. 1934. 7*s.* 6*d.*)

M. ROSTAND seems to have discovered not only the jewel in the toad's head, but the whole regalia of beautiful things which abound in the lives of all creatures. This book considers the Common Toad in relation to the world; every phase of its life is described in detail and a rational explanation is sought for the why and wherefore of all its actions. The book is, in many ways, a curious mixture, for whilst the treatment is generally of the semi-popular type, much of the information it sets forth to convey is only likely to be appreciated by the serious student with some knowledge of the subject. Readers of the latter class will regret the absence of adequate references in the text and the incompleteness of the bibliography and the index.

Competent literary reviewers have given the book unstinted praise, but a too rigid adherence by the translator to the original text often produces the most pedantic results, and also seems to have resulted in the introduction of a verb (to crispate, p. 83) not recognized by the compilers of the Oxford dictionary. On another occasion, however, a laudable desire to avoid "dogginess" results in the rather amazing statement that "Ontogenesis *rehearses* phylogenesis" (Italics mine).

H. W. PARKER.

Textbook of General Zoölogy. By WINTERTON C. CURTIS and MARY J. GUTHRIE, with the collaboration of KATHERINE R. JEFFERS. Pp. xv + 588, with 438 figures. (New York: John Wiley & Sons, Inc. London: Chapman and Hall, Ltd. 1933. 23*s.*)

THIS text-book is an informative and useful work; but it is not easy to fit it into the scheme of teaching followed in this country. It might, however, be recommended as supplementary to other text-books on account of its treatment of sundry special topics.

The cloth of the binding has been impregnated with pyroxylin and is claimed to be water- and vermin-proof.

G. C. ROBSON.

Laboratory Directions in General Zoölogy. By WINTERTON C. CURTIS, MARY J. GUTHRIE, and FARRIS H. WOODS. Second edition revised. Pp. xxxii + 164, with 60 figures. (New York: John Wiley & Sons, Inc. London: Chapman and Hall, Ltd. 1933. 9*s.* 6*d.*)

THE work consists of useful hints to instructors and students, followed by a complete study of the frog principally in the form of practical "exercises" and briefer studies (in a similar form) of representative invertebrate animals.

G. C. ROBSON.

MUSEUM NEWS.

Dr. F. W. Edwards, Sc.D., Assistant Keeper, Department of Entomology, and Dr. George Taylor, D.Sc., Assistant Keeper, Department of Botany, left England on September 28 to lead the British Museum Expedition to study the animal and plant life of areas of high altitude in East Africa, mainly Uganda, and to collect specimens for the National Collections. They will be away about six months.

Dr. L. J. Spencer, C.B.E., Sc.D., F.R.S., Keeper, Department of Mineralogy, will join in November an expedition of the Egyptian Desert Surveys to the Libyan Desert to investigate the origin of the silica-glass found as large masses on the surface of the Desert.

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The following series of Special Lectures on Monday mornings at 11.30 has been arranged for the Winter season :—

October.

1. Dr. C. Tate Regan, F.R.S. : Salmon and Trout.
8. Capt. Guy Dollman : The Evolution of the Horse.
15. Mr. R. Akroyd : The Home of the Eastern Gorilla.
22. Mr. J. Ramsbottom, O.B.E. : Mushrooms and Toadstools.
29. Mr. Maurice Burton : Natural History Lore in Elizabethan England.

November.

5. Dr. Isabella Gordon : Crustacea of the Sea-shore.
12. Miss Daphne Aubertin : Collecting Insects in Dalmatia.
19. Dr. E. I. White : Fossil-hunting in Madagascar.
26. Mr. I. T. Saunderson : An Expedition to Tropical West Africa.

December.

3. Dr. Malcolm Smith : Poisonous Snakes and their Venom.
10. Dr. W. E. Swinton : Dragons.
17. Dr. W. T. Calman, F.R.S. : The Shipworm.
24. No Lecture.
31. Capt. Guy Dollman : Great Game Animals of Africa.

January.

7. Dr. W. D. Lang, F.R.S. : Mary Anning, Geologist.
14. Mr. N. D. Riley : Mimicry in Butterflies.
21. Dr. H. Dighton Thomas : Foraminifera and their Uses.
28. Mr. F. C. Fraser : Stranded Whales on the British Coast.

ACQUISITIONS.

Department of Zoology.

Mounted head of a female addax from the Sudan, a crab-eating opossum, a rat-tailed opossum, and the skin of a Persian leopard; presented by the Rowland Ward Trustees.

An abnormal elephant tusk from Uganda; presented by Mr. George Howard.

An exceptionally fine mounted head of the Upper Nile bushbuck; presented by Major Humphrey Butler, M.C.

Mounted head of a Javan rhinoceros, shot by the late Mr. H. C. Barnard in 1899 in Perak, Federated Malay States; presented by Mrs. H. C. Barnard.

Three skulls of the so-called dwarf elephant from the Gola Forest in Sierra Leone; presented by the Governor, Sir Arnold W. Hodson, K.C.M.G.

Skin of a fine Kodiak bear: presented by Mr. W. Lawson.

Mounted head of a mule deer from British Columbia, and a Spanish red deer head from Sierra Morena: presented by Capt. D. A. Lawson.

Skull of a fine babirusa from the island of Buru, Moluccas: received from Mr. R. T. Warner.

A rare tree-kangaroo from New Guinea; presented by Sir Frank Colyer, K.B.E.

Skins and skulls of two striped hyaenas; presented by His Highness the Heir Apparent of Bikaner.

A collection of fifty mammals, mostly from Scotland, including a series of Scottish wild cats; presented by Col. J. Hamilton Leigh.

Department of Entomology.

The valuable collection of ants which formed the basis of the donor's "Monograph of the Formicidae of South Africa": presented by Dr. G. Arnold, Director of the Rhodesian Museum.

Department of Geology.

A large and valuable collection of type and figured specimens of rhinoceroses from the lower Tertiary beds of Baluchistan, described and figured by the donor; presented by Mr. C. Forster Cooper.

Department of Mineralogy.

An interesting collection of 727 pebbles, illustrating forms, origins, and materials, all carefully labelled and localized; presented by Mr. E. J. Dunn.

Fragments, weighing $4\frac{1}{2}$ lb., of meteoric stones which fell on April 8, 1932, near Temiki on the north-eastern border of the Gash delta; presented by the Director of the Geological Survey of the Anglo-Egyptian Sudan.

An iron meteorite fragment from the meteorite crater recently recognized near Odessa, Texas; presented by Mr. George C. Fraser.

A piece of iron meteorite from the 15-ton mass at Mbosi and a rich specimen of gold quartz from a newly discovered reef in the Lupa goldfield, Tanganyika Territory; presented by Mr. H. V. B. Lloyd-Philipps.

Gold specimens from three mines in Tati district, Bechuanaland Protectorate, and a platinum nugget from Abyssinia: presented by Mr. Hugh S. Gordon.

Metajarlite, a new mineral, from Greenland: presented by Dr. Richard Bøgrad.

Lusakite, a new cobalt mineral; presented by Mr. A. C. Skerl.

A faceted olivine, weighing 101·75 carats, from Burma, and some tektites, "rizalites," recently discovered in the Philippine Islands: purchased.

Department of Botany.

A collection of over 700 plants made by Mr. J. E. Dandy, Assistant Keeper, while with the scientific expedition organized by Mr. C. G. T. Morison to study the soil-vegetation relations in various parts of the Anglo-Egyptian Sudan.

The donor's herbarium, containing about 2000 sheets, mostly from the London area; presented by Mr. J. E. Cooper.

CORRIGENDA.

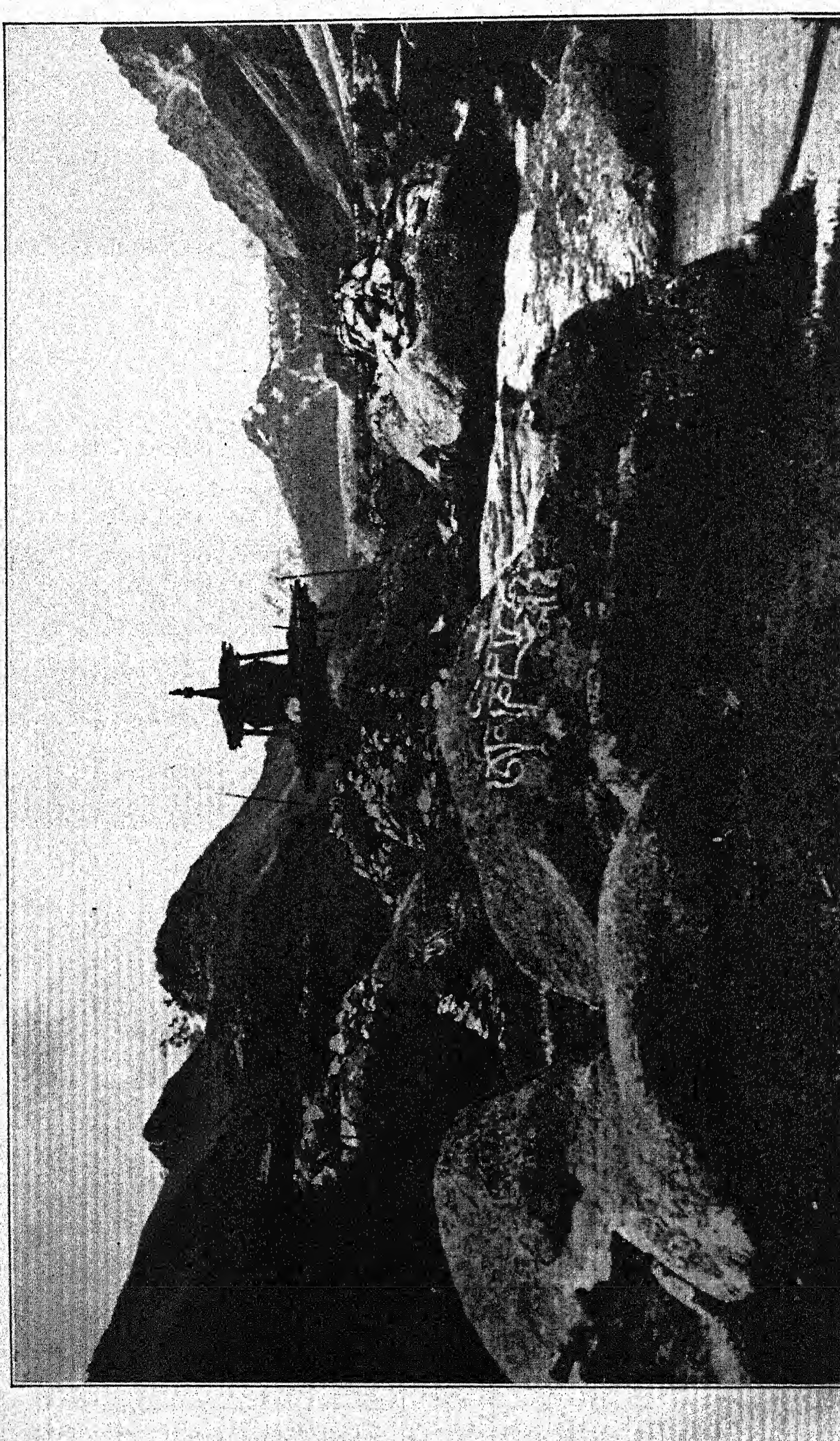
P. 274, line 8, *for* Australian *read* Australasian.
P. 274, line 32, *for* Companion *read* Commander.

INDEX

Photograph by courtesy of Capt. F. Kingdon-Ward.

SERF OF ZAYUL PROVINCE, TIBET.

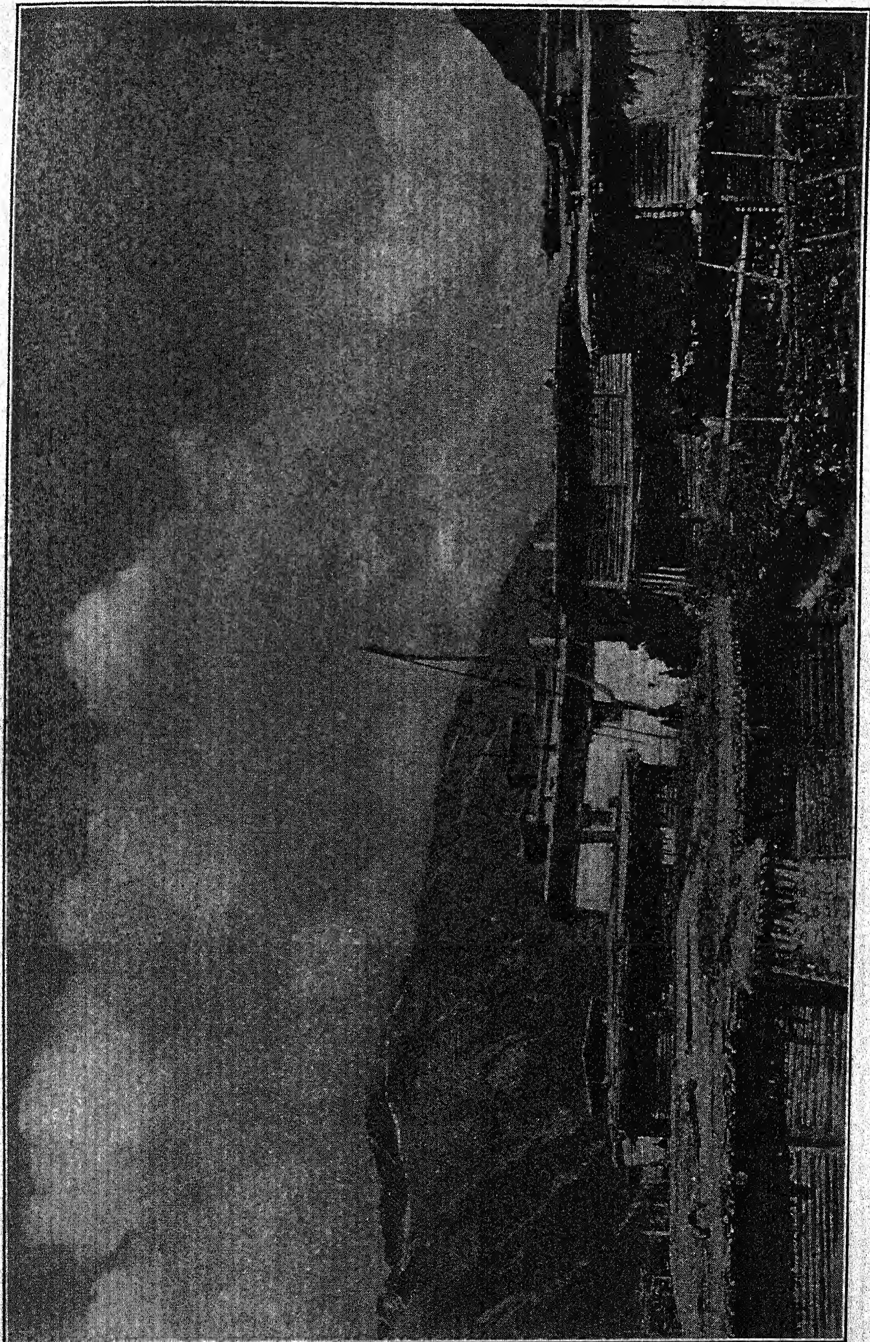
She is not a real Tibetan, but a Tibetanized woman from the jungle.



Photograph by courtesy of Capt. F. Kingdon-Ward.

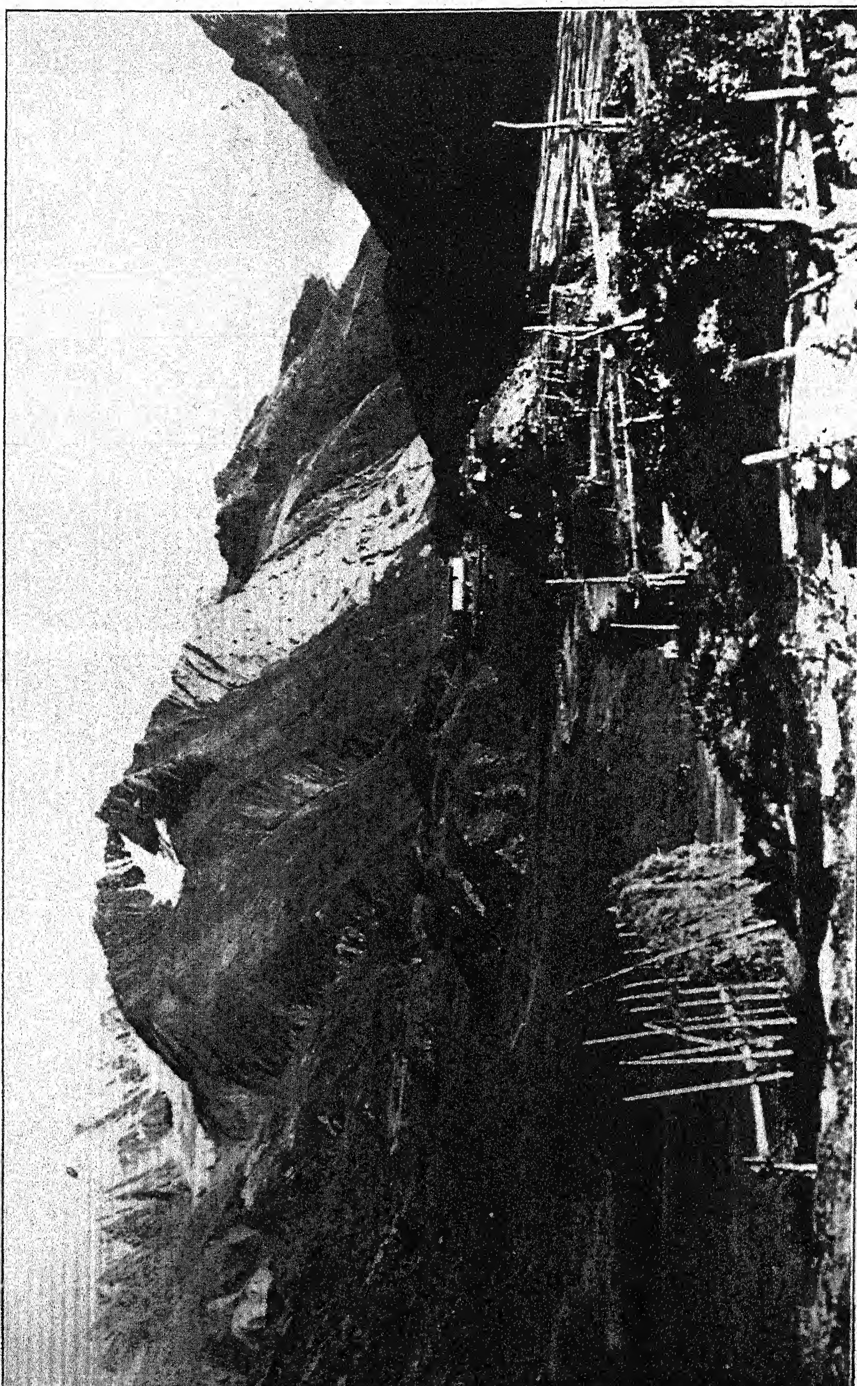
VALLEY AT SHUGDEN GOMPA, TIBET.

The inscription on the rock reads: "*O mani padme hum.*" It is a holy spot, as the *chorten* or shrine testifies.



Photograph by courtesy of Capt. F. Kingdon-Ward.

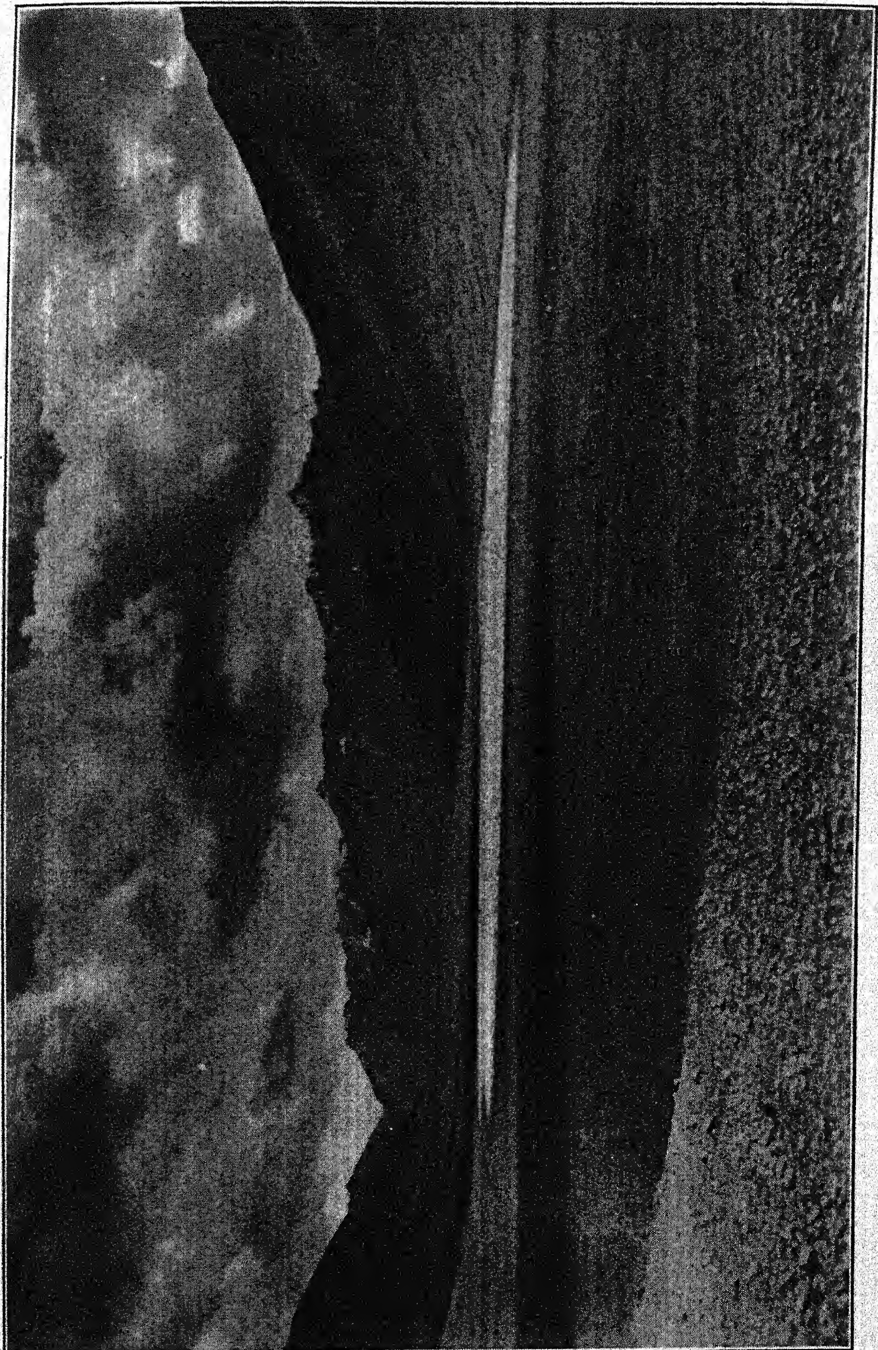
TEMPLE AND PRIESTS' HOUSES, SHUGDEN GOMPA, TIBET.
The altitude is 13,500 feet. The prayer flag may be noted.



Photograph by courtesy of Capt. F. Kingdon-Ward.

HIGHEST VILLAGE AND CULTIVATION IN NAGONG, TIBET.

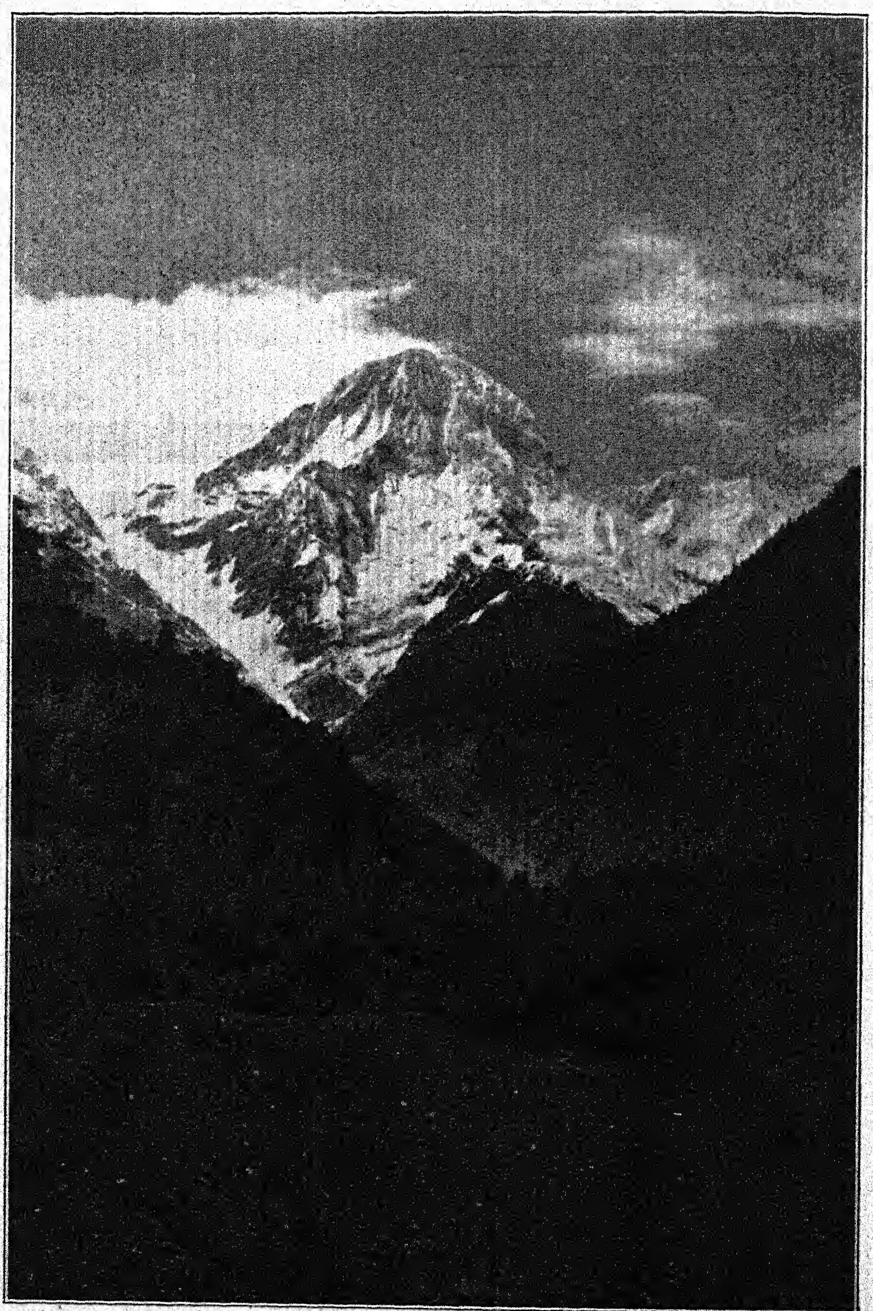
The village is at the foot of the glaciers and about 14,000 feet above sea-level. The crop grown is barley; the straw is dried on these scaffold frames.



Photograph by courtesy of Capt. F. Kingdon-Ward.

LAKE ON THE PLATEAU, TIBET.

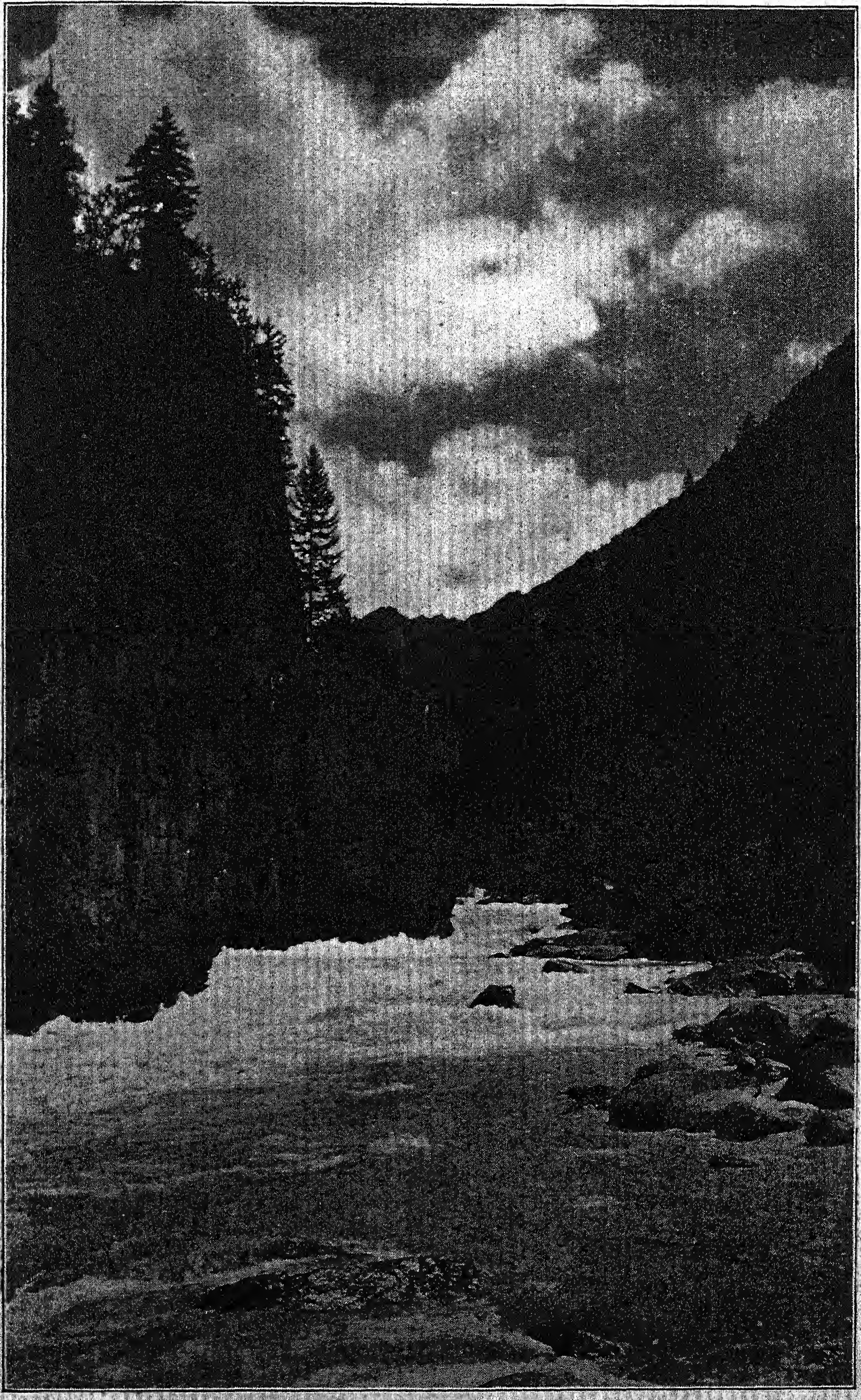
The altitude is 15,000 feet. The pastures are treeless, being north of the rain-screen. Compare plate lxii.



Photograph by courtesy of Capt. F. Kingdon-Ward.

CHOMBÖ, TIBET.

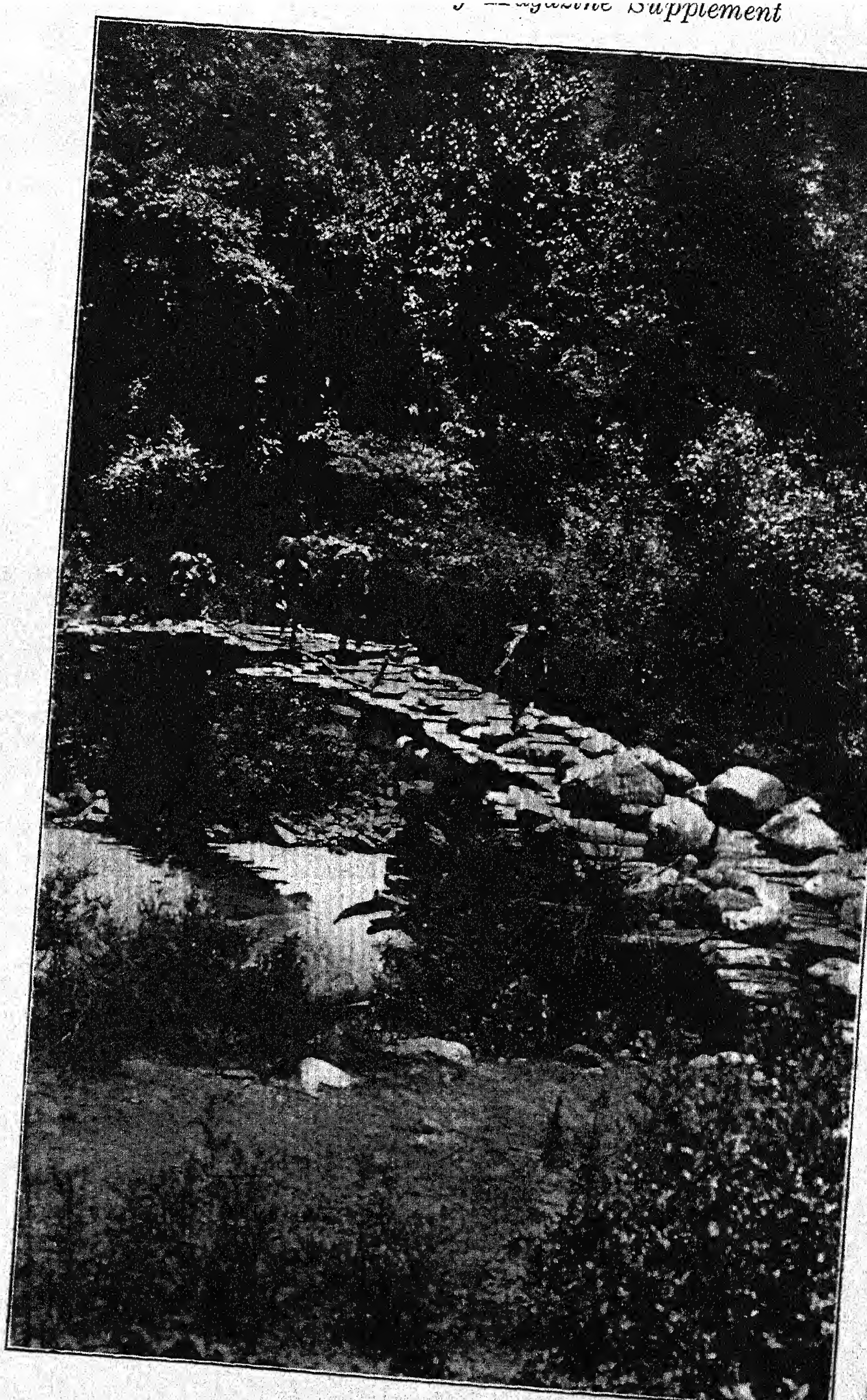
It is a 22,000-feet peak discovered in Tibet. Lying to the south of the rain-screen, it attracts plenty of moisture. The conifer forest at 9000 feet may be noted.



Photograph by courtesy of Capt. F. Kingdon-Ward.

NAGONG RIVER, TIBET.

The river is leaving the treeless plateau and entering a gorge, where forest begins to appear. It is unexplored for nearly a hundred miles below this point, and its course is



Photograph by courtesy of Capt. F. Kingdon-Ward.

WOODEN CANTILEVER BRIDGE, TIBET.

This bridge is in Zayul, the forested part of Tibet. Cattle and ponies can use these bridges.